MAR 1 1 1986 COMPLETED 599

Y4. Ap6/2: S.hrg. 99-217/pt. 2

S. Hrg. 99-217, Pt. 2

Senate Hearings

Before the Committee on Appropriations

---

mf129

Department of Defense Appropriations

Fiscal Year 1986

99th CONGRESS, FIRST SESSION

H.R. 3629

PART 2—(Pages 1–568)

- AIR FORCE AIRCRAFT PROCUREMENT AND RDT&E
- RESEARCH, DEVELOPMENT AND ACQUISITION
- SPACE PROGRAMS
- STRATEGIC DEFENSE INITIATIVE
- STRATEGIC PROGRAMS

S. Hrg. 99-217, Pt. 2

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE

COMMITTEE ON APPROPRIATIONS

UNITED STATES SENATE

NINETY-NINTH CONGRESS

FIRST SESSION

ON

H.R. 3629

AN ACT MAKING APPROPRIATIONS FOR THE DEPARTMENT OF DEFENSE FOR THE FISCAL YEAR ENDING SEPTEMBER 30, 1986, AND FOR OTHER PURPOSES

PART 2—(Pages 1-568)

AF Aircraft Procurement and Research, Development, Test, and Evaluation
Research, Development and Acquisition
Space Programs
Strategic Defense Initiative
Strategic Programs

Printed for the use of the Committee on Appropriations

U.S. GOVERNMENT PRINTING OFFICE
43-738 O WASHINGTON : 1986

I

COMMITTEE ON APPROPRIATIONS

MARK O. HATFIELD, Oregon, *Chairman*

TED STEVENS, Alaska
LOWELL P. WEICKER, Jr., Connecticut
JAMES A. McCLURE, Idaho
PAUL LAXALT, Nevada
JAKE GARN, Utah
THAD COCHRAN, Mississippi
MARK ANDREWS, North Dakota
JAMES ABDNOR, South Dakota
ROBERT W. KASTEN, Jr., Wisconsin
ALFONSE M. D'AMATO, New York
MACK MATTINGLY, Georgia
WARREN RUDMAN, New Hampshire
ARLEN SPECTER, Pennsylvania
PETE V. DOMENICI, New Mexico

JOHN C. STENNIS, Mississippi
ROBERT C. BYRD, West Virginia
WILLIAM PROXMIRE, Wisconsin
DANIEL K. INOUYE, Hawaii
ERNEST F. HOLLINGS, South Carolina
LAWTON CHILES, Florida
J. BENNETT JOHNSTON, Louisiana
QUENTIN N. BURDICK, North Dakota
PATRICK J. LEAHY, Vermont
JIM SASSER, Tennessee
DENNIS DeCONCINI, Arizona
DALE BUMPERS, Arkansas
FRANK R. LAUTENBERG, New Jersey
TOM HARKIN, Iowa

J. Keith Kennedy, *Staff Director and Clerk*
Rebecca M. Davies, *Deputy Staff Director*
Francis J. Sullivan, *Minority Staff Director*

Subcommittee on Defense

TED STEVENS, Alaska, *Chairman*

LOWELL P. WEICKER, Jr., Connecticut
JAKE GARN, Utah
JAMES A. McCLURE, Idaho
MARK ANDREWS, North Dakota
ROBERT W. KASTEN, Jr., Wisconsin
ALFONSE M. D'AMATO, New York
WARREN RUDMAN, New Hampshire
THAD COCHRAN, Mississippi
MARK O. HATFIELD, Oregon (Ex Officio)

JOHN C. STENNIS, Mississippi
WILLIAM PROXMIRE, Wisconsin
DANIEL K. INOUYE, Hawaii
ERNEST F. HOLLINGS, South Carolina
LAWTON CHILES, Florida
J. BENNETT JOHNSTON, Louisiana
ROBERT C. BYRD, West Virginia
JIM SASSER, Tennessee

Staff

Dwight E. Dyer, Richard B. Ladd, Susan E. Shekmar, Wayne A. Schroeder, Sean O'Keefe, Charles J. Houy, and Norma H. Anderson

Administrative Support

Gail Macaulay and Penelope S. German

Minority Staff

Edward A. Swoboda

CONTENTS

Tuesday, April 2, 1985

STRATEGIC DEFENSE INITIATIVE

Department of Defense: Page
Strategic Defense Initiative Organization 1

Tuesday, April 23, 1985

STRATEGIC DEFENSE INITIATIVE

Department of Defense:
Under Secretary of Defense for Policy 63
U.S. Air Force (Strategic Defense Initiative Organization) 75

Thursday, April 25, 1985

AIRCRAFT PROCUREMENT AND RDT&E

Department of Defense:
Department of the Air Force 141

Wednesday, May 7, 1985

SPACE PROGRAMS

Department of Defense:
Department of the Air Force 251

Thursday, May 9, 1985

(A.M. Session)

AIR FORCE AIRCRAFT PROCUREMENT AND RDT&E

Congressional Budget Office 369
Department of Defense:
Department of the Air Force 393

Thursday, May 9, 1985

(P.M. Session)

SPACE PROGRAMS

Department of Defense:
Department of the Air Force 439
National Aeronautics and Space Administration 439

Tuesday, May 21, 1985

STRATEGIC PROGRAMS

Department of Defense:
Department of the Air Force 475
Department of the Navy 485

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

TUESDAY, APRIL 2, 1985

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 10 a.m., in room S-407, the Capitol, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, McClure, Rudman, Proxmire, Hollings, Chiles, Johnston, and Sasser.

DEPARTMENT OF DEFENSE

STRATEGIC DEFENSE INITIATIVE ORGANIZATION

STATEMENT OF LT. GEN. JAMES ABRAHAMSON, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

ACCOMPANIED BY:

FRANK GAFFNEY, OSD POLICY

JIM LINDER, DEFENSE INTELLIGENCE AGENCY

STRATEGIC DEFENSE INITIATIVE

BUDGET REQUEST

Senator RUDMAN [presiding]. The hearing will be in order.

We are here today to review the fiscal year 1986 budget request for the Strategic Defense Initiative. The administration's request of $3.7 billion is $2.3 billion more than the fiscal year 1985 appropriation of $1.4 billion.

This will be the first in a series of hearings we will hold on the Strategic Defense Initiative. This first hearing will cover the specific programs which encompass what is known as SDI. Because of the highly classified nature of many of the programs in SDI, we have decided to conduct a closed hearing. This will enable us to investigate a wide range of technical and systems issues that we would be unable to address in open session.

We have scheduled an open hearing for April 23, to discuss the policy implications of SDI, its relationship to deterrence and arms control and its general economic and industrial impact on the Nation.

We will also schedule an outside witnesses hearing, so that testimony from policy and technical experts on both sides of the SDI issue can be heard.

SDI now comprises 4.4 percent of the fiscal year 1985 Department of Defense research and development budget. The proposed fiscal year 1986 budget would increase that to 9.4 percent.

The $3.7 billion budget request for SDI is 1.2 percent of the total DOD budget for fiscal year 1986, and a third of 1 percent (.35 percent) of the total Federal budget for fiscal year 1986.

FORMATION OF SDI

In March 1983, President Reagan announced the formation of the Strategic Defense Initiative. SDI was not a new start, but a merger of all ongoing research and development in the field of ballistic missile defense. Prior to the President's speech, each of the services, DARPA, and many of the national laboratories had their own separately managed R&D programs.

With us today to discuss the President's fiscal year 1986 budget request for SDI is the Director of the Strategic Defense Initiative Organization, Lt. Gen. James Abrahamson.

General Abrahamson, welcome back to the committee.

Your entire statement will be placed on the record. However, before you begin, I will yield to my friend from Wisconsin for his opening statement.

OPENING STATEMENT OF SENATOR PROXMIRE

Senator **Proxmire**. Thank you very much. I appreciate that.

General, I apologize. I would like very much to hear your testimony. I have heard you before. You are a fine witness. I have great admiration for your ability.

I can't remain, so I will study your testimony very carefully. I will certainly look at all the answers to questions.

WORKABILITY OF SDI

I have a number of questions I would like to ask for the record, too. Let me quickly say that I am very concerned about the SDI because of its workability. It has been, as you know, very vigorously challenged by a number of highly reputable scientists, including the Union of Concerned Scientists who have written a book challenging the SDI, called "The Fallacy of Star Wars."

At any rate, I am also concerned about the effect this is likely to have on arms control. Offhand it would seem to be that the reaction of the Soviet Union would have to be to build more offensive missiles and that would exacerbate the arms race obviously very seriously.

SDI PROGRAM COSTS

Finally, I am deeply concerned about the cost of this program. It starts right off with a bang, going from $1.7 billion to $3.7 billion, the biggest increase I can recall in research, both in dollars and percent.

Although it is a small percent of the overall budget, it is an immense increase, $30 billion over 6 years for research and then the spending really begins with spending which Secretary DeLauer said will stagger us and I am afraid it will.

Mr. Chairman, I am delighted to hear you tell us that there will be witnesses on both sides at the hearings. I hope that we can balance the witness schedule on this issue because it is a controversial issue.

I think we would be well served if we could have some of the outstanding experts in the country who oppose star wars to appear.

Senator Rudman. I certainly assume the chairman will do that. I for one would like to have them also because I have some rather searching questions for them, having read their books as well. I would like to ask some questions about their books.

Senator Proxmire. Thank you, Mr. Chairman.

Senator Rudman. General, we have your total statement.

It will be in the record. You may proceed as you wish.

INTRODUCTION OF ASSOCIATES

General Abrahamson. Before I start, I would like to introduce Frank Gaffney from the Office of the Under Secretary for Policy. Even though this is a closed session where I felt that the concentration would be on the program and particularly the financial aspects of the program, there is such as close policy bind on every aspect of the program, I thought it would be helpful to the committee if Mr. Gaffney was here and available in case there are questions that they would like to ask in that direction.

In addition, I have Mr. Jim Linder from the DIA. We felt this might be a special opportunity to spend a few minutes on the Soviet program so that there could be a comparison. At the end of my initial financial discussion of the program, depending on your wishes, there can be a very short briefing or you may wish to expand that.

Senator Rudman. What is the gentleman's name?

General Abrahamson. Jim Linder from DIA.

Senator Rudman. He is from whom?

General Abrahamson. Defense Intelligence Agency.

Senator Rudman. He is an expert in what they are doing?

General Abrahamson. He is an expert. What we have are some of the photography as well as some of the background that represents some of the scope of their program.

[Clerk's note.—The photographic and background material representing the scope of the Soviet program is classified, and has, therefore, been deleted.]

CLASSIFICATION OF MATERIAL

Senator Rudman. I am very interested. This is a very interesting coincidence because on Sunday Senator Biden, Senator Levin, Senator Cohen and myself are leaving for the Soviet Union for 8 days of talks at the invitation of the Cabinet of Soviet Scientists whom we met with last year.

I had intended to get a very thorough briefing between today and then on precisely what they are doing. After this briefing I would like to spend some time with you because I am very concerned as to how much of what you're presenting today is classified to the extent that they don't know that we know what they are doing.

I would like to get that very deeply embedded in my mind. One of the questions I would like to discuss with them, for it was discussed with them very unsatisfactorily last year is the obvious disinformation campaign they are waging against us and the high degree of hysteria they have expressed about it.

I listen to Radio Moscow at least 3 nights a week. The North American Service devotes a considerable amount of time to that. It is remarkable if what I have been told previously about their activities in fact has been verified.

I would like to be able to discuss that with certain people there, obviously only on the conditions I understand of what is classified and what is not.

General **ABRAHAMSON**. Jim, I would like to lay that as guidance.

Senator **RUDMAN**. It may be that because this is an interest I have narrowly that we want to do it generally here and maybe set it up specifically later in the week.

The chairman has now arrived.

I am just having a discussion with the general. They have someone here today who is going to brief us on the Soviet activities in the area. I would like a very thorough briefing. I am leaving for the Soviet Union on Sunday.

It will be very interesting to hear what they know. He is just about to continue with his statement.

Senator Proxmire was here.

Senator **STEVENS**. I am sorry. I was called to make a quorum for the committee, but they couldn't get their act together. I may be called back again to make a quorum.

I think your trip is very important. We have a long time, General, before we really are going to get to action on this budget. Senator Rudman has a point that we would benefit from a discussion of the Soviet capability.

I suggest you proceed as you want with your statement. Let us get to the Russian discussion soon. We will schedule another session here. I will be happy to pursue the U.S. role later.

General **ABRAHAMSON**. If you would like to do the Russian discussion first, that is fine with me.

Senator **STEVENS**. I have time this morning, too.

General **ABRAHAMSON**. We will start that way. I will ask Mr. Linder to proceed.

Senator **STEVENS**. What is the level of classification?

Mr. **LINDER**. This will be secret.

SOVIET BALLISTIC MISSILE DEFENSE

This is about Soviet ballistic missile defense. I am going to go into some of the conventional ballistic missile defense and what they are doing in directed energy.

Soviet doctrine is one of damage limiting. It is a doctrine that rejects mutual vulnerability, the theory that both sides should lay open to offensive strikes in the hope of deterring war. The Soviets reject that. They have a doctrine of surviving in the case of a nuclear war. They would survive by virtue of massive defenses.

With their ongoing R&D, they have put themselves in a position to deploy ABM systems beyond the treaty [deleted]. They are pursuing SDI type systems on their own, independent of the SDI program and the President's initiative in 1983. They have been doing it for over 20 years.

Senator Stevens. Why is that classified then?

Mr. Linder. This chart is unclassified.

Senator Stevens. That statement you just made about their activities for 20 years is unclassified?

Mr. Linder. Yes, sir; that statement is unclassified. We have publications and an open source of research information since the invention of the laser.

Mr. Gaffney. Senator, we are in the process of preparing a publication which I hope will be available by the middle or the end of this month which will be entirely unclassified. We will go into as much detail as we feel we can on the Soviet SDI ballistic missile defense program and doctrine.

Hopefully, rather than take up your time trying to parse out what is classified—what Senator Rudman needs to know that they don't know that we know—it might be useful to get that document to you.

Senator Stevens. It is a hell of a lot better to have us, when we go on these trips, to know what to talk about, that they know what we know.

General Abrahamson. Mr. Linder, please be explicit about that.

SOVIET MILITARY POWER

The other guidance is that the publication "Soviet Military Power"—1985—is releasable. We think this is an excellent check at the unclassified level as to what information is releasable. I always use that as a guide when I discuss the Soviet ballistic missile defense program with others.

Mr. Linder. Sir, we have never raised the issue with the Soviets specifically. So, a lot of the things are still classified secret and some decision will have to be made as to what can be broken out. That is the general point.

There is some discussion in "Soviet Military Power," the DOD book, that talks about systems at the test range for directed energy. I will show you that when I get to it.

The Soviets have given their strategic defense force a place right in the line with the Soviet rocket forces and the army and the navy, a half million men strong which is more men than are in the navy or rocket forces.

They have a significant force devoted just to defense.

SOVIET ABM ACTIVITIES

Mr. Linder. The Soviets have been interested in ABM systems and ABM R&D since after World War II, when ballistic missiles became a threat. They have programs at Sary Shagan which began [deleted], and which are ongoing now.

There has not been a break in their R&D; it is still ongoing today. The first ABM system and the world's only operational one, began deployment in Moscow in the [deleted].

Senator Stevens. Again, why is that classified. It is classified secret. Why is that?

Mr. **Linder**. Because of the [deleted].

Senator **Stevens**. [Deleted].

Mr. **Linder**. It is the scope of the intelligence that we have. Not particular items. If we went line by line, I could probably declassify some of the items.

Senator **Stevens**. There is nothing on there that is classified that should not be declassified. That is what is getting us in trouble with the Department of Defense. You expect us to defend your programs and then you tell us all this stuff on a classified basis.

That is one reason why we are here. There is nothing on there that is classifiable.

Mr. **Linder**. I have channels that I can go through to get the entire slide declassified.

Senator **Stevens**. It ought not to come here classified.

Senator **Rudman**. Do I understand from the answer other than the numbers [deleted] everything else on that really is not classified?

General **Abrahamson**. The way we have been driving it and the way it appears in "Soviet Military Power" is that the Russians have been engaged in ABM research not only in the conventional area, but also in some of the exotic areas of directed energy that we are now working on in SDI, for a longer period of time than we have and more aggressively in terms of the numbers.

Senator **Stevens**. I think that we have had this situation of overclassification because no one up here has complained loud enough. I am going to start complaining and I will start cutting money out of your budget until you do listen.

You had better take the message back we are going to reduce the amount of money that is included in the classification process unless it is responsive to our needs.

To have me go to Geneva and talk to some of these guys, I can't tell them when was it they first started the ABM system?

I ought to be able to look them in the eye and say you know when you started ABM.

Senator **Rudman**. Get a copy of Aviation Week and you will find out very quickly when they did.

Senator **Stevens**. I believe that is true. I am serious now, General. If you expect us to win the SDI fight, you have to take these chains off us.

General **Abrahamson**. I will take the message directly to Secretary Weinberger to General Williams, head of DIA.

Senator **Stevens**. Go ahead. That is my last outburst.

CONTINUED SOVIET DEVELOPMENTS IN ABM

Mr. **Linder**. There is an ABM system at Moscow deployed in the [deleted] for leadership protection. It is the world's only deployed ABM system. The Soviets are deploying large radars, including the one at Krasnoyarsk, which give them the potential for rapid breakout from the ABM Treaty.

They are doing R&D which also supports possible rapid breakout from the ABM Treaty, including a rapidly deployable missile system. Moreover, they are pursuing future options; they have been involved for nearly 25 years in directed energy physics and technology.

1972 ABM TREATY

We entered into an ABM Treaty in 1972. Why did we go?

We went in to eliminate defense as a strategic factor. The Soviets went in to achieve their counterforce objectives. Using the ABM Treaty coupled with SALT I, the Soviets were able to constrain United States offensive forces and meet their offensive force requirements.

At the same time they constrained U.S. defense, again so that they could meet their counterforce requirement. They may or may not have had low confidence in the system they could have deployed in 1972. We think meeting their objective of a constrained, undefended U.S. force was more important.

The future: We don't know what is going to happen. The Soviets are in a position to break out of the ABM Treaty if they choose to, but SDI may have a mitigating effect on that. They may hold off until they see what happens here with SDI in the near future.

The system deployed in the [deleted] at Moscow and currently there consists of dish radars capable of looking at only single targets at a time; aboveground missiles on surface launchers here—64 missiles. It is a limited deployment which has been there for [deleted] years and you could say it is for troop training. It would be good in case of limited attack or United States response to a Soviet first strike.

That situation is changing. A brand new system is going into Moscow including a large phased-array radar near Pushkino. It is [deleted] along the base here, [deleted] would fit on the roof. This is estimated to be $1.5 billion of U.S. radar equivalent. It will replace the old dish radars and give the defense a multiple target handling capability.

They are putting silos in for interceptors. They are adding a different kind of missile to the silos, a high acceleration missile [deleted].

Senator Rudman. What is the warhead?

Mr. Linder. [Deleted.]

This will give you some perspective. This is the center of Moscow. [Deleted.]

Overall, the upgrade to Moscow, a brand new system that is going in, has a higher saturation limit in terms of the targets coming in because it is phased array technology replacing the old dish-type radars.

[Deleted.] Because of this radar technology, this system can be expanded beyond treaty limits just by adding more interceptors.

Senator Rudman. What is the range of that radar?

Mr. Linder. [Deleted.]

Senator Stevens. What is the timeframe for use of that?

Mr. Linder. [Deleted.]

ACQUISITION RADARS

In addition to the work going on at Moscow, the Soviets have deployed a brand new system of large acquisition radars at six locations around the Soviet Union. Those are in addition to the long-range radars already in Moscow.

They have coverage of all ocean areas and coverage of U.S. ICBM's coming in from the north.

I want to point out that this is the Krasnoyarsk radar, the one in violation of the ABM Treaty because of the large portion of the Soviet Union which it overlooks.

It also is virtually identical to the radars which the Soviets have said are for early warning. We have looked at it for space track. It does not do anything for space track.

We looked for the contribution in makes to missile defense and we get a large contribution.

Senator Rudman. What about the other gap?

HENHOUSE RADAR

Mr. Linder. This is the Mediterranean gap covered by Henhouse radar. [Deleted.]

The Soviets could add radars here in the west as well, but they don't need to. [Deleted.]

Mr. Gaffney. If you overlay that spread of radars on top of the existing radar base, that area is covered by a fan of older Henhouse radars as well.

PECHORA RADAR

Mr. Linder. What I have done here, I am showing you the Pechord radar up in the north, transmitter and receiver, these are about $300 to $400 million apiece in U.S. value. This radar the Soviets have said is for early warning of ballistic missile attack.

KRASNOYARSK RADAR

This is the radar at Krasnoyarsk. You can see, if you can see it well, why we call it virtually identical, this is one the Soviets have said is not designed for ballistic missile warning, but only for space track.

RAPIDLY DEPLOYABLE RADAR SYSTEM

In addition to the surveillance radars which we feel would be the base for a widespread ABM deployment if the Soviets were going to deploy one, there is the system that is in R&D [deleted] considered a rapidly deployable system [deleted].

This radar would get data from the large radars on the periphery, called battle management data.

[Deleted.]

[Deleted.] It is a system that can be deployed in months rather than the years it takes for a large system like the one at Moscow.

Senator Stevens. They could have used those in a place at Krasnoyarsk?

Mr. Linder. No, sir; these are engagement systems that work at short range. They would take data from Krasnoyarsk. That is the significance of Krasnoyarsk. There is now coverage in an area where there was none before.

Senator **Rudman**. What is the most recent test of the previous slide?

[Deleted.]

Mr. **Linder**. [Deleted.]

Senator **Rudman**. How did the tests go?

Mr. **Linder**. [Deleted.]

You get benefit out of having two layers in a system like this. [Deleted.]

Senator **Rudman**. [Deleted.]

Mr. **Linder**. [Deleted.]

Senator **Rudman**. [Deleted.]

Mr. **Linder**. [Deleted.]

Senator **Rudman**. [Deleted.]

Mr. **Linder**. Yes, sir.

Senator **Rudman**. You don't want to discuss it here?

Mr. **Gaffney**. We get into a higher level of classification.

Senator **Rudman**. Fine. I would like to talk about that at a later time.

General **Abrahamson**. We can, at any time you like, go to a higher level of classification. We would need to go to top secret and code word classification levels if you want to discuss this topic further.

Senator **Stevens**. We can get to that at the end. Just tell us if we are getting off the reservation.

SAM MISSILE SYSTEM

Mr. **Linder**. In addition to the conventional ABM system at the test range, we know that the Soviets have [deleted] SAM interceptors on launchers within the Soviet Union, something like 1,000 sites.

They are also developing a mobile SAM which has an antitactical ballistic missile role. When we look at this system, it looks like, if you make certain assumptions which appear reasonable, it might have the capability to intercept strategic missiles.

SA-X-12 SYSTEM

This is a system called SA-X-12 which may be deployed this year or next and may be deployed in an ABM role. It could have a significant effect in circumventing the ABM Treaty even though the Soviets don't otherwise break out of it.

To move from conventional ABM to what I will call unconventional, the Soviets have a directed energy program [deleted].

I will show you a vugraph of that later.

[Deleted.]

SARY SHAGAN TEST RANGE FACILITY

This is a facility at the Sary Shagan test range which is a Soviet ABM test range, a facility that has been there since the early 1970's [deleted].

Senator **Stevens**. That is still R&D?

Mr. **Linder**. Yes, sir. It could begin operating this year and once it operates, if it is feasible, if it works out well, the Soviets could deploy in the early 1990's a system based on that.

[Deleted.]

ACCURACY OF CURRENT INFORMATION

Sentor **Rudman**. If I may ask one question. What level of agreement is there within the intelligence community as to the accuracy or what kind of confidence do you have in this information you are giving us?

Mr. **Linder**. There is agreement on the information I have given you. The only disagreement would come when you begin to project deployment dates.

GENERAL POWER AND EFFECTIVENESS RESEARCH

Sentor **Rudman**. The nature of the research, what they are doing, is general power and effectiveness?

There is agreement in the community on that?

Mr. **Linder**. That is right.

Senator **Rudman**. There is no disagreement?

Mr. **Linder**. There is no disagreement. [Deleted.]

General **Abrahamson**. [Deleted.]

Mr. **Linder**. [Deleted.]

Senator **Johnston**. [Deleted.]

Mr. **Linder**. [Deleted.]

COMPETENCE OF WEAPON SYSTEM

Senator **McClure**. Does the briefing get into the question of the competence of that kind of weapon?

Mr. **Linder**. [Deleted.]

Senator **McClure**. Yes. [Deleted.]

Mr. **Linder**. [Deleted.]

Senator **McClure**. [Deleted.]

Mr. **Linder**. [Deleted.]

General **Abrahamson**. Senator McClure, I have a tape showing some of the progress we are making [deleted.] I will show you that. [deleted.]

Senator **McClure**. Thank you.

Mr. **Linder**. [Deleted.]

Senator **Rudman**. [Deleted.]

Senator **Stevens**. I want to remind staff that the reason we hold this here is because we rely on the transcript for any future reference. We have a policy of not allowing staff to leave here with notes of these briefings. I hope that you will abide by that.

If you want access to this transcript and you are authorized to have it by your Senator, you may have it. But we come up here so that we will avoid the concept of having classification material get into our personal safes and whatnot.

I hope that you will respect the way we are trying to approach this and comply with that request.

Thank you.

Mr. **Linder**. [Deleted.]

POWER SOURCE

Senator **Stevens**. What is the source of powe

Mr. **Linder**. [Deleted.]

Senator **Rudman**. [Deleted.]

Mr. **Linder**. [Deleted.]

Senator **Rudman**. [Deleted.]

Mr. **Linder**. [Deleted.]

CIA AGREEMENT WITH DIA INFORMATION

Senator **Chiles**. Do we have CIA people here today?

General **Abrahamson**. No, sir; we don't.

Senator **Chiles**. Do they agree with DIA?

General **Abrahmason**. I believe he is explaining the difference.

Mr. **Linder**. [Deleted.]

Senator **McClure**. [Deleted.]

Mr. **Linder**. [Deleted.]

Senator **McClure**. [Deleted.]

Mr. **Linder**. [Deleted.]

Senator **Stevens**. [Deleted.]

Mr. **Linder**. [Deleted.]

BATTLE PHASES

I have tried to put some of what the Soviets are doing in the SDI context. We have battle phases including surveillance. The battle phases run down this side. The roles of the systems are here in terms of surveillance, the weapons, the auxiliary support you get both from radars and from logistics. When you do that, there are very few areas within which the Soviets are not working. They have had a weapon focus while we have not had one until recently.

OVER-THE-HORIZON RADAR

I didn't talk about the over-the-horizon radar. They have large facilities for over-the-horizon detection. They have ground radars, network of satellites, computers adequate for battle management.

I want to summarize that the Soviets' interest in ABM defense is a doctrinal interest they have had for 25 years. It is not something that depends on what the United States does in defensive effort. It is governed by U.S. offense, but it is not a reaction to any U.S. defensive effort.

NATIONAL TERRITORY DEFENSE

We do see some components in the field that indicate that the Soviets may be planning a defense of national territory. They have those large radars, Krasnoyarsk being the latest one. They could be a base if the Soviets wanted to use them to support an ABM deployment.

Senator **Johnston**. What kind of national territory?

Is that a point defense for their ICBM's, not a canopy defense?

Mr. **Linder**. The large radars I am talking about are mostly on the periphery, but here is the one at Krasnoyarsk.

What I would like to say, they are on the periphery of the defended area even though they are not in the case of Krasnoyarsk on the periphery of the country.

The defended area could be anywhere in the central and western Soviet Union. Incoming targets would be detected and tracked by these radars. These radars would hand off data, information on where the attack is going, to engagement systems like the ones the Soviets have in R&D that will be deployed anywhere in here. Not necessarily silo areas, but areas of high value, including bunkers, C^3 facilities, other military target areas.

Mr. **Gaffney**. [Deleted.] It probably would be overstating it to suggest that you could have a bubble or canopy defense over that area, but you would be able to provide—particularly if the U.S. attacking forces were attrited in a first strike against the United States—for example, you could provide a pretty important preferential defense of [deleted] targets within the protected area.

RAGGED RETALIATORY STRIKE

General **Abrahamson**. Especially against a ragged retaliatory strike.

Senator **Stevens**. Would you repeat that last?

General **Abrahamson**. Especially against the kind of ragged retaliatory strike that would ensue if indeed they carried out a first strike.

Mr. **Linder**. We believe that the Soviets are going to continue to pursue SDI type systems with the weapon focus independent of what the U.S. SDI does.

Senator **Stevens**. You are talking about ground-based systems?

Mr. **Linder**. No, sir, ground-based and space-based lasers and particle beam weapons.

Senator **Stevens**. I didn't see anything in your briefing that addressed space-based systems.

Mr. **Linder**. I do have a vugraph of that. [Deleted.]

UNANIMOUS AGREEMENT OF INTELLIGENCE COMMUNITY

Senator **Rudman**. As to that information you have just presented from that chart, how much agreement or disagreement is there among all the various parts of the intelligence community on that?

Mr. **Linder**. There is no disagreement.

Senator **Rudman**. There is no disagreement?

Mr. **Linder**. No, sir.

Senator **Rudman**. If the CIA people were here as well as all the others, they would agree with those conclusions?

Mr. **Linder**. We use the same data.

Senator **Hollings**. Does the Sandia Corp. that does the appraisal in New Mexico, do they agree with that?

Mr. **Linder**. [Deleted.]

General **Abrahamson**. [Deleted.]

SOVIET STATUS IN DIRECTED ENERGY APPLICATIONS

To go one step further in terms of your question, sir, a neutral particle beam can only be operated in space. It is not a weapon that could be used in the atmosphere.

Senator **Johnson**. Who is ahead in most of the technologies that would make up on SDI?

General **Abrahamson**. I believe the Soviets are ahead in certain of these directed energy applications or at least there is some evidence that they might be.

How far ahead is a very difficult judgment to make. However, I do believe that we have a fundamental advantage here in the West and that is in computer technology and applications. In order to make any of these very active systems operate and to be able to have a command and control system that provides the [deleted] you must have tremendous capability in computers and computer applications.

Here we have a fundamental advantage over the Soviet Union.

So, I think it is a mixed picture, but in some of the weapons applications here I think that they are ahead.

Senator **Stevens**. Thank you very much.

General, you have been very patient.

Senator **McClure**. Could I ask one question?

SOURCE OF ENERGY FOR SOVIET SPACE-BASED WEAPONS

What is the source of energy for their space-based weapons?

General **Abrahamson**. Actually, if it is a chemical laser similar to some of the ones that we have experimented with here, you don't need a huge power input. The laser itself is in essence a very small rocket that operates in closed confinement. It is that combustion that provides much of that power.

You do have to have some external power, but not a great deal.

Senator **McClure**. You are not talking about nuclear generated?

General **Abrahamson**. No, sir. However, the Soviets have had a nuclear reactor flying supporting their deployment of space-based radars which they use primarily in terms of tracking ships and they have had one of those flying for a long time.

Senator **McClure**. But that is low power output.

General **Abrahamson**. It is reasonably low power output.

Mr. **Linder**. [Deleted.]

Senator **McClure**. [Deleted.]

Mr. **Linder**. No.

Senator **Stevens**. [Deleted.]

Mr. **Linder**. [Deleted.]

TECHNOLOGY ISSUE

Mr. **Gaffney**. May I make one more point on Senator Johnston's question which is very much apropos of the deliberations this morning.

The technology issue is part of the problem. Much of the intelligence briefing before you arrived dealt with the weapons applications of much more modest technology. I think there is no disagreement that with respect to how quickly one side or the other could deploy a modest ballistic missile defense capability, the Soviets have important advantages: Advantages as a result of the enormous investment they have made in the radars you have seen here, advantages as a result of having maintained a production base to support a deployment program around Moscow and investments such as we have seen which suggest the capability rapidly to expand that base to provide a defense of a much larger area than just the Moscow area.

All of those are areas of decided advantage on their part.

VERIFICATION OF RESEARCH PROGRAM

Senator **Stevens**. Gentlemen, now we really set this up so that General Abrahamson could tell us what we are doing. We went into the Soviet case. If there is no objection, we will go to the planned presentation.

General **Abrahamson**. I will concentrate on the progress we are making on the financial aspect of the program. In the process of doing that I will try to get across how it is that we have such a large financial requirement because of such a very, very broad program.

So, I will try to illustrate that. That will give you some feel for what I am talking about.

First of all, there has been so much public discussion of the program that is incorrect, that there is this impression that we are embarked on a deployment program or are really going beyond research into true development stages, and that is not the case.

This is clearly a research program. It is a research program which must be conducted within the ABM Treaty limits, and, in fact, the limits outlined in the ABM Treaty, become, in a sense, the definition of how far we can go in research and really provide a political and decision milestones prior to going into development.

We are trying to pursue this broad program, so that one could have enough of a body of information from tests conducted within the treaty that you would be presented with reasonable options from which to make decisions. The political decisionmakers could then say, yes, this option makes sense, we could start the development and deployment process sometime in the early 1990's.

Outside of that I have no schedule as such. However, clearly recognizing it takes a broad base of research, there is a very important difference between this program and others. Perhaps the best way to explain that is comparison with the F-16 program—I have used this example in some of our explanations with some of our European allies who have not been able to really tell the difference between research and development.

I was responsible for the development of the F-16 during the development and initial production and deployment of the F-16.

In order to accomplish that, and we did it in a very short timeframe, we completed the development program after we flew the prototype, and started initial production in three countries in 3 years.

The reason we were able to do that, which is, I think, shorter than any more recent system in terms of fighters, is because we had engines that we could call on. There was no original aerodynamic work that had to be done. All we had to do was to look at the progress in aerodynamics, select the wings, select the fuselage and put that together.

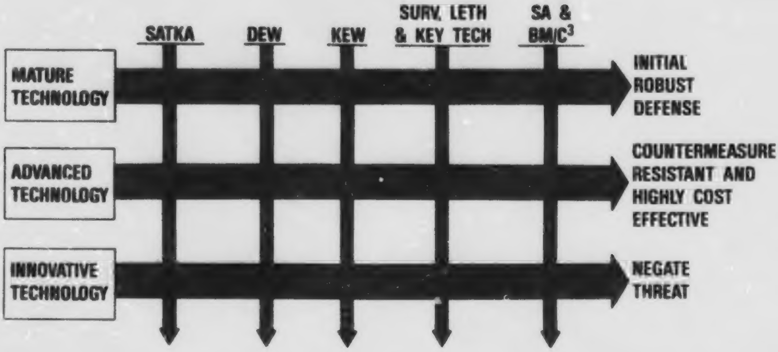
In the avionics systems, there were inertial navigators and computers that were available. We made improvements, and we integrated them in different factors, but they were there.

So, it was a weaponization development process.

DEVELOPMENT OF SUBSTANTIAL TECHNICAL BASE

Here we do not have some of the fundamental kinds of capabilities that are possible. In some areas they are available to us, but in general we have to go back to a very substantial technical base and build that up. I will try to illustrate that with a series of slides as I go through.

HOW ARE SDI EFFORTS INTERRELATED?



SATKA

DEW

KEW

SURV, LETH & KEY TECH

SA & BM/C^3

MATURE TECHNOLOGY → INITIAL ROBUST DEFENSE

ADVANCED TECHNOLOGY → COUNTERMEASURE RESISTANT AND HIGHLY COST EFFECTIVE

INNOVATIVE TECHNOLOGY → NEGATE THREAT

TECHNOLOGY EVOLUTION

SLIDE 1

FLETCHER STUDY

General **ABRAHAMSON**. We started from a technology base that actually predated the President's speech. In fiscal year 1984 the Fletcher study said it may well be possible to build the kind of rather splendid defense that the President has laid out and has set as an objective.

However, we have to exploit emerging technology. The Fletcher study reached that conclusion, because we already had a start in many technology areas, some of which were not devoted at all to an ABM system, but were important stepping stones. Therefore, we tried to pattern our research based on the technical roadmap laid out by the Fletcher Committee.

We have now gone well beyond that roadmap, and we are pursuing some different directions. This is indeed a very fast moving program, and one of the main reasons it was set up to be centrally managed was so that we could take advantage of progress and cut out programs that turned out to be less promising.

Now, those programs, had they not been cut either in the Department of Defense deliberations as they got ready for fiscal year 1985 or in the Congress, and that is an important proviso, would have come in at about $1.5 billion.

Our request last year was $1.77 billion and that is exclusive of about $200 million of research in the Department of Energy.

After the cuts which finally developed in the final appropriation process, we came out with less than that $1.5 billion. That was a 21-percent cut last year. So, we had to make some rather substantial corrections. We tried to do that as well as possible, but it did have an impact.

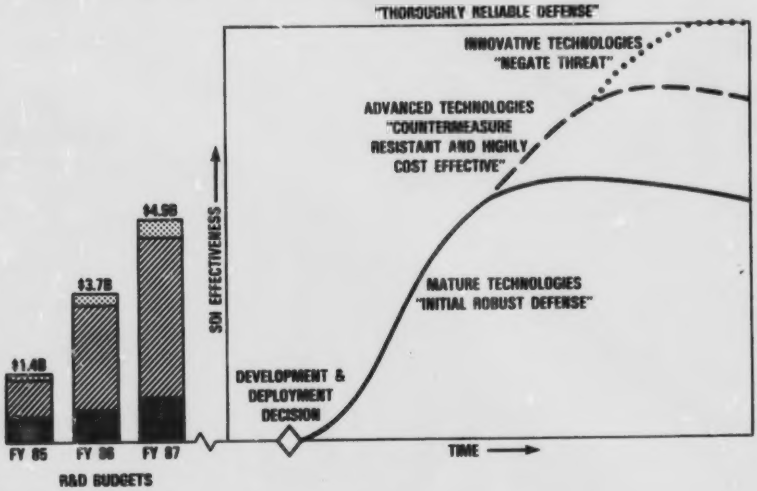
It does mean that contributes to the jump as we go forward into this program. I will try to illustrate that in some areas.

We do have the money divided into five essential breakouts here and I have broken one of them out further than that.

Those are the same five breakouts of surveillance, acquisition and tracking, directing energy weapons, kinetic energy weapons, and then batttle management and space logistics.

Those were the same five elements that Mr. Linder showed you when he lined up the Soviet space program.

MEETING THE SDI GOAL



SLIDE 2

PROGRAM MAKEUP

General **Abrahamson**. Now, the program is really made up of a very large number of small projects and several very large projects, not large like the development of an F-16, but certainly large when you compare it to the very large number of small projects that are vital to being able to go ahead here.

Now, several of these technologies are more mature. I am trying to find a way to explain the content of our budget. There are mature technologies which could be earlier options.

If we proceeded somehow with an early decision, we would have to build on these mature technologies. But they have to be run across all of these five program elements, and I will make the point you should not only focus on the weapon.

In order to have a system, you must be able to have surveillance, you must be able to have the weapons themselves, you must be able to ensure that it can survive. Therefore, we have to have survivability and lethality studies. It is all tied together with the battle management system.

So, you should not confuse a mature weapons system with our being at a point to quickly deploy a system based on that technology without filling in a lot of the necessary infrastructure.

Behind that there are advanced technologies that are very important for reaching the goal of what the President has laid out which, as we have tried to describe it, is a thoroughly reliable, not perfect, defense. There is no perfect weapon system, but one that is effective and very effective, and the difference, I think, is in the key as we commented here.

The Soviet defense that we think they could deploy is essentially a defense that fits into [deleted].

So, when the Soviets combine an offensive first strike that destroys an important part of our ability to retaliate with strategic defenses added to their passive defenses, this becomes a meaningful kind of system for them.

But that is not what we are trying to do. We are trying to in fact find a way to have an effective preventive defense that will be very effective so that we discourage that first strike form ever happening.

This is a system to prevent war and to make nuclear missiles obsolete, certainly to take away all of the tremendous, out of proportion, value these missiles have at this point in time.

Therefore, we are going in a different direction. We have to be much more capable, and we have to also rely more heavily on advanced technologies.

Now, you saw the Soviets are not ignoring these areas either, but it does serve their initial purpose. It has even a partially effective one where it doesn't serve ours in the same way.

But to reach this very, very effective system in the future we also have to invest now in innovative technology. These investments are again not only in weapons, but across this whole range of technology broken down into five program elements.

[**Slide** 3 **deleted**]

General **Abrahamson**. So, if I were to describe where we are in the research program, what kind of budget buildup we have and try to relate it to what it is we hope to achieve—now I don't know when this would occur because it is not only a technical decision, it is also an affordability decision and certainly a political decision on what is happening in the world at that point in time, but if we decided to proceed and if you had done all this research properly, this would be an effectiveness line.

This line represents the thoroughly reliable defense the President was after. Again, some of the mature technologies today would have to provide this initial robust defense, but these technologies would never be good enough to achieve a defense that couldn't be countered and that would be highly cost effective out in the future.

So, here are the advanced technologies and here is the investment in innovative technologies that hopefully would drive you up to that thoroughly reliable defense goal.

UNITED STATES MESSAGE TO SOVIET UNION

Now, what is the relationship between this and what we are doing today?

It is important today that the Soviets do not think we are only going to go part way. Otherwise, they will miscalculate and say we will get partly downstream and if we make a decision, we will run out of technology here, or they could overcome what we are doing.

Therefore, it is important that they see that we are investing in all of those ranges, and we are investing and making progress in all of these ranges.

So that it is a fairly visible program, it must remain visible.

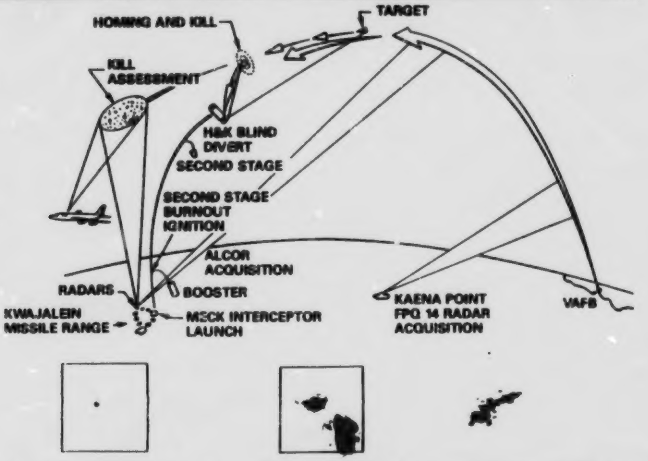
Now, we are not investing a huge amount of money in the more advanced technologies just because they are fairly mature. These take a lot more research. It is a lot more expensive.

Therefore, the majority of the money in these years is devoted to some of their advanced systems with the objective of being effective against countermeasures and cost effective.

Again, a small investment is warranted for these very innovative technologies in the future and I will give you some examples of that.

Now, that is intended to provide some structure to the budget in terms of technology category.

HOMING OVERLAY EXPERIMENT


TARGET
HOMING AND KILL
KILL ASSESSMENT
H&K BLIND DIVERT
SECOND STAGE
SECOND STAGE BURNOUT IGNITION
ALCOR ACQUISITION
RADARS
BOOSTER
KWAJALEIN MISSILE RANGE
MECK INTERCEPTOR LAUNCH
KAENA POINT FPQ 14 RADAR ACQUISITION
VAFB

HOE INTERCEPTOR FLYOUT TO INTERCEPT

MOMENTS AFTER INTERCEPT

KILL ASSESSMENT AIRCRAFT VIEW OF REENTRY COMPLEX

SLIDE 4

MATURE TECHNOLOGY

General ABRAHAMSON. Let me move ahead with an example of what might be a fairly mature technology. Before I do that I would like to start by talking about a demonstration that gives us confidence in a mature technology, this was that flight of the Army Homing Overlay Experiment last June where we successfully "hit a bullet with a bullet" for the first time.

I believe that has been broadly misinterpreted as to the meaning or implications of that particular capability.

UNITED STATES TEST WITH SOVIET MISSILE WARHEAD

I know you are familiar with this. This was an experiment that was built on technology and investment that was started a long time ago. It was certainly not weaponized. Because I am a rocket guy and I came from NASA where I ran the shuttle for nearly 3 years, I like to show a little bit of fire and smoke.

This is the launch of the Minuteman out of Vandenberg Air Force Base. That was our target. On the front of that rocket we had a simulated Soviet warhead. That was fired just as if it were a normal test firing toward Kwajalein Missile Range which is 4,500 miles away.

At Kwajalein on a pad on Meck Island we had the interceptor. That just happened to be assembled from various rocket components that allowed us to conduct this demonstration within the ABM Treaty. We just used some of the normal radar at Meck

Island to get an initial incoming jog and then it triggered off that flight.

What happened in space and here is what we really demonstrated: The ability to accurately strike with a nonnuclear warhead. This is just an animation to show what happened.

The first two stages burnt out initially which accelerated the missile or this sytem. Then up in space the cover came off and an infrared or heat-seeking tracking system, took over. It was good enough, and here is the first thing we demonstrated, to see a warhead, not a rocket—it didn't have to have a rocket exhaust, but a warhead with its inherent heat even before it struck the atmosphere, against the blackness of space. That was the first thing.

The second thing is that we could maneuver in such a way that we could strike this thing right on the nose. Now, we did have this device which came out [deleted] had little balls on it and had it even hit out here on the edge, it would have destroyed it, but we hit it right square on the nose.

Here is a picture then of some of the tracking. Now, because this is tracking from the ground, we are watching the rocket as it goes up, this is the man on the ground who is using this as his target here.

You will see burnout and staging. Then you will see some things go through here. Those are stars because, of course, he is tracking very, very rapidly and moving very fast. You will see a jostling around a bit. That is because when the star came through, it startled the man tracking. It does not mean he did anything. That is the star.

Now, you see the very active maneuvering so that it can hit square. That is the next difficult job that we demonstrated, that kind of effective guidance system—you can't stay with it very well—and then the intercept.

WARHEAD RANGE

Senator **Rudman**. What was the range?

General **Abrahamson**. We intercepted at [deleted]. We confirmed this with an aircraft. We pulverized the warhead.

Here are the pieces of the warhead as they reentered the atmosphere and burned up.

Now, because that was on a rocket that was fired somewhere near a terminal phase, the press and many others have said we have shown we can do terminal nonnuclear defense. That is wrong.

What we showed is that we can intercept in space with nonnuclear means. If that were fired from a submarine up in the North Sea, it could have been a midcourse interceptor and it could have worked in that layer of our proposed defense.

Had it been in Europe, it could have been a midcourse interceptor for an SS-20.

Had it been located in North Dakota with a more powerful rocket, it could have reached out over the entire United States provided with the proper warning.

If it were in space, provided that we were trying to do the intercept above the horizon of the Earth, it could have been a space-based boost phase killer.

I think that is extremely important to recognize. We did that demonstration within the treaty, but the point is that we did demonstrate the capability to intercept at these incredible speeds, nearly [deleted] closing velocity.

Therefore, we are saying that if it were based in space like this, aimed generally in the direction you want, with a plain old rocket on the backend to accelerate it—that if we could miniaturize the system we would indeed have a mature technology that could be used in boost, postboost, midcourse, and kind of large terminal area defense, but that is not enough.

Here is the problem. In order to be able to utilize that in a weapon system, we have to have things developed in surveillance, acquisition, and even in directed energy technology.

A couple of examples of that. We need a system out there which can tell us much more accurately than it can today that the Soviets not only have launched, but would give us an initial track. That is a much more difficult job than the present one that our present surveillance satellites have.

Senator JOHNSTON. Did you have your rocket preaimed from Kwajalein?

General ABRAHAMSON. Only in the general direction. Remember, that warhead is about this wide. We hit it head on. At [deleted] we hit a target that big.

Senator MCCLURE. Could you have done the same if you had not know what the launch point was?

General ABRAHAMSON. We would have had to be able to ensure in a very short space of time we could get it wheeled around in the right direction and get it in what we call a box. The box should be fairly large [deleted]. I am not sure of that actual number, but I believe that is the order of magnitude.

HOMING OVERLAY EXPERIMENT

Remember, I mentioned that we are talking about that kind of system. The homing overlay experiment, the quickness that was in it, was about [deleted] pounds. Its capability was accelerated about [deleted]. That is old technology. That started a long time ago.

In terms of technology, where we are today is the [deleted]. We have that same maneuvering and infrared detection capability of the HOE in a vehicle weighing about [deleted].

Remember, we didn't try to optimize anything here. We just did it as cheaply as possible with off-the-shelf equipment. It is a little slower for this particular intercept. In order to be able to develop the kind of nose section here that we would like for a space-based system, we would like to get it down to about one-fourth or so in terms of weight and be able to accelerate it faster which means we would have to have a rocket on the back of it so that it can go faster.

Here is an example of the kinds of research to make components smaller, more effective, and more cost effective.

I would like to emphasize that as we go through.

Remember, I said we had to have surveillance. The satellite that we might build in the future that will be part of this system will look very different than the satellites we put up now.

When Dr. Garwin and others talk about the inherent vulnerability of satellites, they are talking about today's satellites and people get the image of these spindly little things we put up today. They will be quite different in the future.

Here is one artist's concept of a satellite with armor on it to withstand laser energy coming from the Soviet Union. It also has maneuvering capability and enough fuel so that it could maneuver and be able to counter at least the Soviet coorbital Asat that they have now, and then other kinds of systems.

But we are not building this as such, although in fiscal year 1986 we do have a start in some of the system work.

In order to make this program effective, we have to be able to track exactly where that vector is coming from when the missile is fired. It is a very different order-of-magnitude of performance requirement.

ADVANCED IR SURVEILLANCE

Slide 5

DETECTOR ARRAYS

General **Abrahamson**. Therefore, the program is made up of many of these small projects.

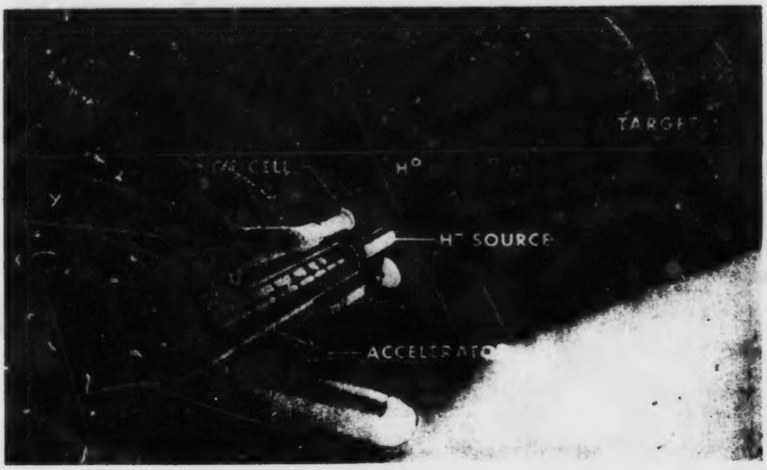
For example, new kinds of infrared detector. Detector arrays for our present satellites may have 100 or so of these infrared detectors that you use in a spinning mode. We have an experimental one with 1 million or so. We now are working on one with tens of millions of detectors that we can get into a size reasonable enough that you could put it in one of these satellites.

Here is an example of the kinds of projects that are located within the program. Mirrors for the infrared frequency band act differently than mirrors for visible light.

These detectors only work if you can have cryogenic refrigerators that can get you very close to the lowest temperature in the universe. So, the program has six different kinds of technology efforts working on cryogenic refrigerators and different kinds of chip development to support some of the data computation right behind the detectors. So that the computer is built in that first stage.

So, the point is in order to develop even that satellite, we are not developing the satellite, although we are doing some system work, but we have to have many kinds of projects ongoing and they are small, but they are important components of this.

NEUTRAL PARTICLE BEAM WEAPON



SLIDE 6

NEUTRAL PARTICLE BEAMS

General **ABRAHAMSON**. Now, the same thing could happen in a neutral particle beam system. I showed you an example of what I classified as mature technology.

Now I would like to move up to something that is advanced technology, neutral particle beams. Again, you have to have surveillance. You have to be able to point this system and develop it under this line. You have to ensure that it can survive and that you have cost-effective transportation because transportation would be pretty expensive.

BEST

So, we are investing in the technology that would allow us to bring down the cost of space transportation. It has to have a battle management C^3 system.

Now we have one of those today. I guess I really want to make this point. We have made these first steps in many cases. This is a neutral particle beam experimental laboratory weapon at the Los Alamos Laboratory.

[Deleted.]

RESEARCH COSTS

Now our problem is can we make it bigger? What are the scaling laws? Will it operate the same? Can we make components to make it inexpensively, that it can be put into space and operate in space.

By the way, I mentioned that the Soviets are working on space-based neutral particle beams. Neutral particle beams cannot work in the atmosphere because as it fires in the atmosphere, the large stream of hydrogen atoms—that is what a neutral particle beam is—would become charged as the electrons are knocked off and the magnetic field of Earth would cause the beam to veer off.

Here is an example of one of the large projects. It takes a lot of money to develop this and to move up into the next stages. Pure research, but very attractive.

By the way, this is one that we would like to accelerate because [deleted].

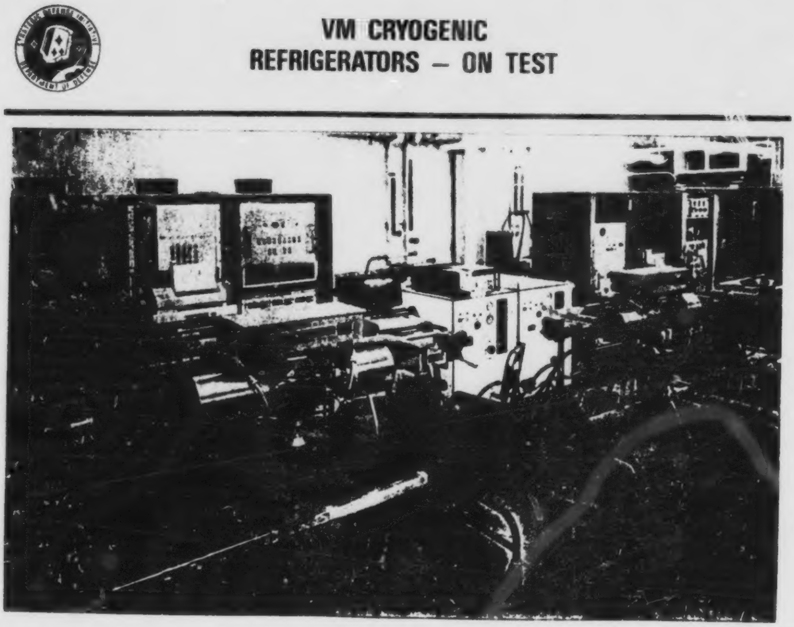
This is a new concept we are beginning to work on now. That is classified.

[SLIDE 7 DELETED]

General **ABRAHAMSON**. I said we have to be able to survive. In our survivability program we are essentially [deleted] seeing what kind of countermeasures the Soviets could build and employ against us, and then testing these [deleted] in laboratories.

Can they find ways to make them invisible to us? Can they find ways to counter our infrared systems?

We are doing [deleted] on them. So, there is a series of projects which are intelligence related that add up to [deleted] dollars in that first one—surveillance, acquisition, and tracking.



VM CRYOGENIC
REFRIGERATORS – ON TEST

SLIDE 8

CRYOCOOLER DEVELOPMENT

General **ABRAHAMSON**. Now we have made a great deal of progress and I can show you a great number of pictures.

Let me just say that we are now developing ways where we can do active discrimination and we are developing long-life cryocoolers that are essential for this process.

We have now passed the accelerator light testing concept. We have made improvements in detector resolution. We have now a very large chemical laser operating, but this one is an interesting one and it is one of the more subtle ones, the ones you asked about.

It shows the far-flung nature and different kinds of tests—[deleted].

This represents a ground-based laser and initially a very high quality beam could come out. However, the atmosphere has many thermals and currents in it that would cause this laser beam to lose its power.

This diagram shows that a beam would be distorted if it went up to a mirror which then would be focused on a target, it would be distorted in a way that you would lose power.

[Deleted.]

This is some of the equipment itself. Here is the laser, [deleted] that we are woking on. This is where the low power laser fires out into the atmosphere.

As I indicated, we are now doing experiments only [deleted].

I can give you a feel now for how effective that is. [Deleted.]

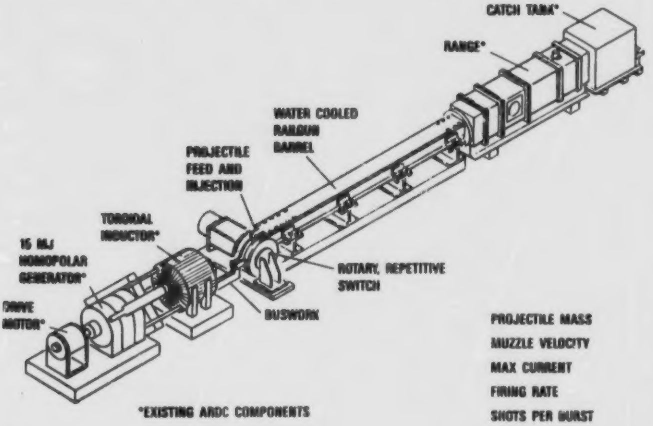
FLAT LASER BEAM

Perhaps another way to look at that is, remember, I showed the flat laser beam. That is a hologram of the quality of that laser beam. In the beginning it is not very good. You can see here again it is not very good.

[Deleted.] We are solving this particular kind of problem.

Now, the Soviets may be doing equivalent kinds of research. [Deleted.] It is an example of some of the research programs that have given us a great deal of hope because we are making progress in such a very rapid way as we proceed.

MULTI-SHOT EM GUN TEST FIXTURE


CATCH TANK*
RANGE*
WATER COOLED RAILGUN BARREL
PROJECTILE FEED AND INJECTION
TOROIDAL INDUCTOR*
15 MJ HOMOPOLAR GENERATOR*
DRIVE MOTOR*
ROTARY, REPETITIVE SWITCH
BUSWORK

*EXISTING ARDC COMPONENTS

PROJECTILE MASS	10 G
MUZZLE VELOCITY	5KM/SEC
MAX CURRENT	500KA
FIRING RATE	4Hz
SHOTS PER BURST	3-5
BARREL LENGTH	6M

Slide 9

ELECTROMAGNETIC GUN

General **Abrahamson**. We go ahead with a whole series of things. We have an electromagnetic gun. In November, for the first time we fired [deleted]. That was with this particular system.

[Slide 10 deleted]

General **Abrahamson**. We talk about putting these kinds of systems in space. [Deleted.] We would like to be able to fire at [deleted].

Here we have already fired at [deleted]. We are about [deleted] of the way there in speed.

As I indicated, we fired [deleted]. By the way, the research task is not to make the gun. In this case the research task is to make switches that will allow us to switch very, very rapidly where there are [deleted] amperes of current.

That is being accelerated effectively down the system. Also finding a way to make very, very effective generators to produce the power.

General **Abrahamson**. Those are a few examples, but you can see then the sequence of how we go up in each of these areas and I would like to point out that I have hundreds of these small projects, very low level that it is quite difficult to reduce.

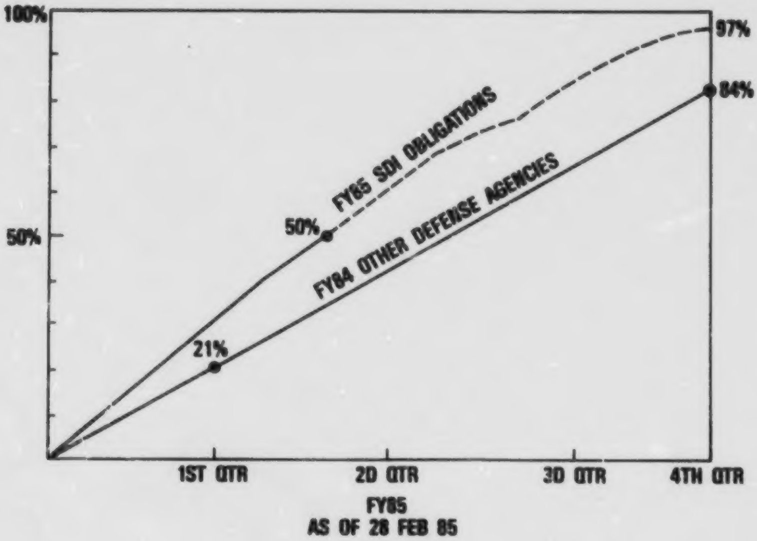
Here is the 1984 level as we move up into 1985 and finally in 1986 mostly in surveillance, acquisition and tracking, directed energy weapons, about $1 billion.

Many of those things are trying to reduce the cost. For example, I have 26 different projects, some of them very small, in mirrors. The kinds of mirrors we are talking about are equivalent to what NASA did in the space telescope.

That mirror took 4½ years to build. We have to find ways we can reduce the cost, reduce the time, put coatings on, make them low weight, allow them to be computer compensated.

So that we have many projects of that kind. Here you can see the buildup in each of these areas.

SDI FY85 OBLIGATION RATES



Slide 11

MANAGEMENT SYSTEM

General **Abrahamson**. Now, a legitimate question for you and others to ask us is do we have a management system in place that can indeed operate with these large amounts of money and effectively make decisions about what we fund and get them on contract?

I would just like to state that we just got started in October in terms of doing our own contracting. Remember, we don't contract out. I have a small organization, at this point only about 80 people, but for my essential direction we utilize the Army, the Navy, the Air Force, NASA, Department of Energy, anywhere there is capability, to manage our programs.

Utilizing those systems, we were 37 percent obligated in fiscal 1985 in the first 3 months. Now, that is a program that is not one large contract, but is many contracts, and there is not anybody else in the Department of Defense that has demonstrated that kind of performance.

That was not just willy-nilly getting on contract. I also went out and canceled several programs and modified others dramatically in order to absorb the cuts during that same timeframe.

I believe we have shown you in this year's performance that we have a management system in place that can operate. It is not because of our central managment, it is because of some very fine terms out in the services and Department of Energy that are making this happen.

REDUCTIONS

Senator **STEVENS**. You have a paper that demonstrated how you absorbed the cut last year?

General **ABRAHAMSON**. Yes, sir; we provided that.

Senator **STEVENS**. Give us some sort of summary so that members can know what went into the reduction, how the reduction was taken last year.

General **ABRAHAMSON**. Yes, sir. We are looking for a backup chart.

We absorbed over 50 percent in six large programs. What we did was delay getting on contract because that would have built up fairly quickly.

General **ABRAHAMSON**. Here you can see those six large programs. That is the airborne optical adjunct, that is in the aircraft that has on it a telescope that allows you then to see effectively in a way that is different than seeing from satellite. That is part of the philosophy—to have two different ways to do everything so that they can't destroy you. The other way is the terminal imaging radar, a demonstration of radar tracking in the atmosphere.

The HEDI demonstration would be a follow-on to that homing overlay interceptor.

Here we have set cost goals of being able to take that system and to make it very small in terms of size and to bring it down below $1 millions for each of the interceptor activities, excluding the rocket, the part that you saw operate in space.

So, I emphasize that we are making a major effort to bring cost down, because this won't be effective unless there are affordable options for everyone in the future.

TALON GOLD

Talon Gold was a pointing and tracking experiment. It is one program I changed substantially because it did not meet all of our pointing and tracking requirements. I broadened it out into a larger number of experiments.

There will be some delays, although certain parts of it will move forward in that process. Other parts will be delayed.

So, you can see that we indeed took slightly over half of the program reductions there in those large projects. The rest of it we distributed through some of our smaller projects primarily by delaying certain starts.

We are kind of at the point that we have done a lot of paperwork and now we are beginning to reach the point where we are building more hardware.

Senator **STEVENS**. Are you using Redstone Arsenal capability in this program, too?

General **ABRAHAMSON**. Yes, sir. That is the Army capability that, of course, has been sustained throughout the entire period ever since the ABM Treaty.

We don't spend an awful lot of money down there, but it is a fine team. In fiscal 1986, about 35 percent of our total overall budget is going out through their central management and research capability.

Senator **STEVENS**. How much of this budget you have is actually out in the private sector as opposed to in-house military capability?

General **ABRAHAMSON**. I would have to provide that for the record, but when I refer to say Redstone, what I am saying is that there is a team of people out there, some 650 researchers, technical managers, financial managers, the majority of which are supervising contractor research.

In some cases they are providing additional money that goes out to our in-house laboratory such as Los Alamos or some other, but the majority is out in the private sector. I use that capability because, of course, those are very talented people working in these areas of technology for a long period of time.

[The information follows:]

NEW ACTIVITIES

During fiscal year 1985, there were many activities started that have programmed fiscal year 1986 follow-on. These efforts are existing commitments to do work if the program is appropriated. The value of such efforts in fiscal year 1986 is approximately $2,5BM. This means that the work is already defined and negotiated and is only awaiting the new fiscal year funding.

REVERSE TECHNOLOGY TRANSFER

Senator **STEVENS**. Gentlemen, does anyone have any questions about this?

Senator Rudman was here first.

Senator **RUDMAN**. I guess I have just two questions, General. I am quite interested in the slide that you showed us regarding reverse technology transfer.

I can see we can do that once in a while, I guess it is 1 to 1,000 that that would happen.

General **Abrahamson**. I have used that in unclassified presentations. You can mention that to the Russians if you want to.

Senator **Rudman**. It seems to me that that particular slide which indicates technology that they first published—you said in 1969—certainly ought to give us pause around here as to those people who say it is pie in the sky and no one is going to make it work.

That is great rhetoric, but nobody really knows that. That certainly indicates that in terms of their ability with physics and mathematics which has been sterling for a century, that is going to give you a lot of concern.

Can you respond to that? How far ahead of us were they with that particular device?

General **Abrahamson**. We didn't bring this along as a weapon until just the last few years. Now we don't think that they [deleted].

It is quite difficult to know exactly where they are. [Deleted.]

SOVIET INVENTIONS

Senator **Rudman**. The basic research has led to at least the theoretical modeling that allowed them at least to produce that if they had the applied technology to build it. That, as I understand it, is considerably ahead of what we had at that point by a matter of years; is that correct?

General **Abrahamson**. Yes. In fact, there are three separate Soviet inventions in that as a weapons system. I only showed you one because it is dramatic and you can see it in terms of size. But the [deleted] are all Soviet inventions.

Senator **Rudman**. The only part of the briefing I didn't understand is the device using a projectile rapidly fired.

Was that one of your kinetic——

General **Abrahamson**. Yes, sir.

Senator **Rudman**. If that could be miniaturized, how would that be used?

General **Abrahamson**. It could be used in several ways, sir. But the way it is envisioned that it would be used primarily is as a weapon in space.

[Slide 12 deleted]

General **Abrahamson**. Again, here is a picture of this. This is an artist's concept. This would be the power and housekeeping and all the computer work. It would have a very, very long barrel with the electromagnetic coils which accelerate the projectile.

Then it would have a device so it could turn around and aim. The aim does not have to be nearly perfect like a laser aim. This would be about [deleted] long according to our calculation at this point in time.

It is a space-based system which could be used to destroy warheads or could be used to destroy boosters.

Now, this is quite different from this one. Here we are limited, you reach a point where it just is not practical to accelerate much further with conventional rocket technology.

Here you can get up to this very, very much higher speed. We think [deleted] is the maximum cost effective kind of place to get with conventional rockets.

Here we are talking about [deleted].

KINETIC ENERGY DEVICE

Senator **JOHNSTON**. That is kinetic energy?

General **ABRAHAMSON**. Yes, kinetic energy device. It destroys by impact. The projectile has to [deleted].

Senator **RUDMAN**. It would have [deleted] in it?

General **ABRAHAMSON**. [Deleted.]

Senator **RUDMAN**. In a projectile weighing how much?

General **ABRAHAMSON**. This is an ideal kind of role. I don't think we can reach that in any near term.

Remember, each time we make it smaller, we reduce the cost of this whole system. I keep coming back and stressing this. It would not be enough for us to bring to all of you and to some future administration only a technically feasible set of options. It has to be affordable on a national basis.

A major part of our effort is just aimed at this affordability issue.

Senator **RUDMAN**. My last question you partially answered.

I notice you titled this slide "Examples of Technology Evolution."

General **ABRAHAMSON**. Yes.

Senator **RUDMAN**. In our level of mature systems and all the way up to innovative this is in the middle?

General **ABRAHAMSON**. This is in the middle. This is what I call mature.

Senator **RUDMAN**. What you are saying about that system is that the theoretical research to make that possible?

General **ABRAHAMSON**. Yes.

Senator **RUDMAN**. The applied technology to miniaturize and all those things, when people say all this is pie in the sky, what you are saying is that the physics and mathematics to make that work are done?

General **ABRAHAMSON**. Yes.

Senator **RUDMAN**. I think that is a very important point, General.

Senator **STEVENS**. Senator McClure.

TREATY LIMITED

Senator **MCCLURE**. You started out by saying we are treaty limited.

What are the limits of the treaty within your definition?

General **ABRAHAMSON**. We have provided, so that everybody can deal with this at their leisure, an explanation of the treaty issues in terms of what we can do and what we can't do.

They really fall in two categories, sir. In that way you can look at it at your leisure.

Let met give you a brief summary and then I think Mr. Gaffney would like to comment as well.

For systems that would be made essentially of interceptors and radars similar to what we have discussed under, or what we initially deployed up in North Dakota, we can go beyond research. We can go from the research phase to testing as we did with the homing overlay interceptor, and we could operate within the treaty, so long as we did not exceed 100 interceptors and each of those interceptors and certain characteristics, for example, not having multiple warhead capability, that is, having only one killer in the front, we could go all the way to deployment.

In that sense with some very specific limits on mobility you can do that.

Senator **McClure**. Did I understand a specific weapon, a specific means, is not within the definition of the system? Am I correct?

General **Abrahamson**. No, sir. It would be a system, but if it were composed of radars and interceptor missiles, the kinds of technolgies that are referred to in the treaty, we could deploy 100 of these things all the way through research, development, and deployment and do that within the treaty.

That is allowed.

Senator **McClure**. You could do a lot of research and development as long as you don't go to a deployment of a system of 100?

General **Abrahamson**. No, sir. We could even deploy 100 of these things.

Senator **McClure**. You can do an infinite number of testings that don't result in the deployment of 200?

General **Abrahamson**. Yes, sir; that is correct.

Senator **McClure**. That is our interpretation?

General **Abrahamson**. I think that is the generally accepted interpretation. But I am only talking about the limited kind of systems.

Now, the problem with that is that that is not going to do us a lot.

Senator **Stevens**. I think this is very important. We will have an unclassified session. I would hope that we confine our questions here to the classified portions so that information like this can be fully disclosed. I hope you will ask it in open session, in other words.

General **Abrahamson**. That is only one category. Frankly, while that gives us some flexibility, it is very limited in terms of its total capability. The more important areas are some of what is referred to in the treaty as "other physical principles" or mobile systems. These are very severely restricted. We can conduct what we define as laboratory or research types of tests. That does not mean it has to be under a roof, but we could not go out and do a mobile demonstration like a firing from a submarine or a firing from space against a ballistic missile.

I think that is the key point.

Senator **McClure**. A follow-on question that may or may not be classified.

TREATY VIOLATIONS BY SOVIETS

Whether and to what extent we have detected violations by the Soviet Union under the criteria which we have established for ourselves.

General **Abrahamson**. I think it is very difficult to detect all of those.

Mr. **Gaffney**. If I may, Senator, you have touched on a very important point.

We have very clear guidance from the President with respect to conducting this program within the ABM Treaty. What is substantially less clear of the ABM Treaty in particular is what all of its various limitations mean.

There are numerous gray areas. There are numerous definitional ambiguities. There are numerous, somewhat abstract concepts, if you will, that we have over time unilaterally interpreted.

In some cases there are agreed statements, but even there are oftentimes misunderstandings. I think what you are questioning is to what extent have we seen the Soviets pursuing in their own programs, some of which you have had briefed here this morning, research activities, developmental activities, in some cases even deployment activities, that seem to suggest their adherence to a different standard.

In some cases I think we can say there are different standards, different approaches being pursued. An example, I think, is in this area of the SA-X-12. You had a briefing this morning which suggests that that technology has some applicability for strategic antiballistic missile purposes.

You can argue about exactly how much, but it is pretty clear that they are not restraining the SA-X-12 consciously to a level that we have in the past adhered to in restraining our tactical Antiballistic Missile Research Program such that ours were quite clearly below the threshold and their system is quite clearly above the threshold.

The Krasnoyarsk radar is clearly an altogether different set of problems.

SOVIET VIOLATIONS OF ABM TREATY

Senator McClure. I refer to appendix B-2, subletter S, both in the text and in the footnote. We have not in this report considered Soviet violations of the ABM Treaty.

Are there violations of the treaty which they have committed by our standards that are in areas where we would like to do things if we were permitted to do it?

In other words, they may violate in a direction we don't care and wouldn't want to go.

Are we restrained by our interpretation of the treaty in areas in a precise area where they have not restrained themselves to the same extent that we have?

Mr. Gaffney. If I could suggest a general answer and ask General Abrahamson, who is managing the technology, to get into specific areas.

From the policy point of view it has been pretty clear that the areas that they have probed most aggressively are areas into which we have been relatively uninterested in going. That is with respect to some of these conventional terminal technologies, as opposed to the more advanced technologies, they have set certain standards.

Now, to the extent that we wish to mirror their programs we might find it useful to adhere to the same standards that they have. I think the U.S. program as it is presently structured places less emphasis on big radars and numerous terminal interceptors with nuclear warheads.

So, the applicability of their standards to some of our research work may not be terribly useful.

My own guess is as we watch their more advanced technology work develop, we are going to see them establishing or adhering to certain standards that may indeed be useful to us in our own interpretation of the treaty. But I think that is a point which has not been reached thus far.

General **Abrahamson**. I would like to add a comment, but I would like to add it in executive session, if I may, at the end.

Senator **McClure**. I appreciate that.

Let me ask just one final question, kind of along the same line.

CHARGES AGAINST SOVIETS BY UNITED STATES

We have a regular treaty compliance activity, they look at what we are doing and make target against us. We look at what they are doing and we file complaints with them.

That may be for the record rather than take the time to do it now, but I would like to know what we have charged them with in terms of violations, what they have charged us with in terms of violations and whether or not we take a look at their antimissile defense testing of some of their SAM systems and have we charged that as a violation and similarly could they then or have they then looked at the Kwajalein test as a violation by us of similar limitations?

What is the symmetry and what does that do to our programs and what does it tell others we ought to be doing in terms of treaty compliance?

General **Abrahamson**. At this level I can answer the question about the Kwajalein test. They did not in other forums, but in the public domain they charged us with violating the treaty, not because of the way the test was conducted or what we did, but because we used as a first stage a partial booster of an old system that was now out of date and out of our inventory.

We think that is clearly and very simply absolutely not a violation, but they chose, for propaganda purposes, to put that out in the newspapers.

Now, that never was picked up in a very broad way in this country, [deleted].

So, I think they are using it for propaganda purposes and we will see more of that as we go ahead.

Senator **Stevens**. Senator Hollings.

Senator **Hollings**. Thank you, Mr. Chairman.

The Army in 1980, General, testified that they were shooting for a [deleted].

Is that still the date?

General **Abrahamson**. No, sir; that kind of planning, as well as I know—I was not in the business at that point—concerned our development of an improved protection system for our offensive missile systems. They were looking at the MX and the MX racetrack pattern and how they could further confuse an attack against the MX racetrack pattern by using ballistic missile defense.

We are building on that technology. We have not set any particular date for deployment and in fact we are not building on it so much with its original purpose in mind [deleted].

So, we are building on the technology, we are not throwing it away. We do not have a specific schedule leading to a deployment date in any phase of this research program.

We are taking the technology along as fast as is reasonable, but not for that specific thing.

BUDGET ASSURANCES

Senator **Hollings**. I don't exactly know how to ask a question about assurances.

Can you efficiently spend an additional $2.3 billion?

In other words, you are jumping from $1.4 to $3.7 billion. Is that it?

General **Abrahamson**. Yes, sir.

Senator **Hollings**. You see on the other side the situation where there is a general feeling in Congress that there is a lot of this waste, fraud, abuse, overruns, and everything else, there has been an inordinately high jump in defense expenditures overall in the last 4 or 5 years.

What assurances could you give the committee that you could efficiently handle $2.3 billion?

In other words, we have scientists trying to look for economies saying you could not possibly spend $1 billion.

Where are you going to spend $2.3 billion in 1 year?

Why not give you $1 billion more and hold out for the following year?

CONTRACTING OUT

How can you let contracts in an economical and efficient fashion?

General **Abrahamson**. There are really two issues associated with that. The key is that we have a large number of research teams out in many locations. We have already demonstrated, as I indicated, that we can effectively "get on contract" the first quarter of this year better than any other Department of Defense agency.

So, I think that our track record this year is evidence that we are building to that capability and I believe that we can at that point. Many of those contracts will not be new contracts. They will be the ramp up in funding going from plans and from initial kinds of component research into the next phase of building hardware that goes along with those research programs.

Senator **Stevens**. That point was made to me by the Secretary. Could you document that this is a natural flow to a substantial portion, substantial percent of this increase is a natural flow from what you have done so far?

General **Abrahamson**. Yes, sir.

Senator **Stevens**. It is within the capability of expanding existing contracts?

General **Abrahamson**. Yes, sir; I can.

[The information follows:]

DISTRIBUTION OF SDI FUNDS

Approximately 60 percent of the total SDI funds currently go to the private sector. The remaining 40 percent is used by other Government agencies, which also contract out to the private sector. Consequently the total for private section will be approximately 70 percent.

APOLLO PROGRAM

Senator **HOLLINGS**. Go ahead and complete your statement.

General **ABRAHAMSON**. Contrary to an awful lot of myth, this is not so unprecedented. It is characteristic of a program where you are pursuing a large number of parallel concepts. I can show you, for example, the curve on the Apollo Program.

[SLIDE 13 DELETED]

General **ABRAHAMSON**. Here you can see, and you should think about this, there was some early funding by NASA of various concepts which, frankly, involved a fair amount of money. They were jumping up in fairly substantial ways at that point.

Finally they began to move into the real development phase and that was an incredible jump. You can see a large jump at that point from this $3 to $6 billion where they essentially doubled.

Senator **HOLLINGS**. That was research?

General **ABRAHAMSON**. That was not exactly research in the same way we are doing it, but it was not exactly development like in an airplane system either.

Senator **HOLLINGS**. What was it?

General **ABRAHAMSON**. It was halfway between the two, sir.

They were developing the Saturn V, for example, they were developing a larger system. They were bringing along parallel hardware concepts to make that work.

They were doing the same thing with each element of the system. It has been done before. I can provide for the record some jumps in other more conventional programs.

The point is that it has been done. I believe that we do have a capability.

Senator **HOLLINGS**. Thank you, Mr. Chairman.

Senator **STEVENS**. Senator Johnston.

Senator **JOHNSTON**. General Abrahamsom, you mentioned $200 million was in DOE.

General **ABRAHAMSON**. Yes, sir.

ASAT PROGRAM

Senator **JOHNSTON**. Asat would not be in this program, would it?

General **ABRAHAMSON**. No, sir. The Asat Program that the Air Force is making is an operational program. It is a development and operational program leading to an operational capability.

Senator **JOHNSTON**. Wouldn't there be a lot of the same technologies in that program?

General **ABRAHAMSON**. Yes.

As I indicated, with that one picture where we are today, yes, there is a close relationship in some of those. I assure you we are working very carefully with management teams that work there in order to make use of that.

But we did not feel that it would be useful to mix up in the SDI program this operational development which is needed for today's requirement.

Senator **Johnston**. I would hope we can give you what you need in the so-called SDI Program, but if we do not, aren't there kindred technologies in other parts of the defense budget that could—in other words, you don't have to have all of this funded subnorm SDI under this particular program?

There would be another way to get it done, would there not?

General **Abrahamson**. I believe it is exactly the opposite, sir. Let me give you an example.

FLETCHER COMMISSION

The the Fletcher Commission went out and looked at the various technologies—and I will give you a concrete example—they found technology necessary for a strategic defense program which was underway for other purposes. Computers fall in this category, and probably the most dramatic example is galiomonsonite development.

Right now in your watch and in most of the computers we have for military applications there is a little chip made out of silicon. For systems which must be survivable, silicon is radiation resistant. If the Soviets chose to attack our older satellites with a nuclear weapon and saturate them with radiation, they would have a devastating effect in certain areas. We just could not allow our satellite system in the future to have that kind of susceptibility to radiation.

Therefore, an important program was underway within DARPA, and it was the galiomonsonite pilot production line. It was being developed and was proceeding in DARPA not just for SDI, in fact, nobody even thought of it in terms of SDI.

They recognized that was a clear military requirement. At some point it would be used, not for SDI, but for a whole bunch of different kinds of programs.

Today, SDI is the imperative. The Fletcher Commission looked at galiomonsonite development and felt it was useful to SDI It was brought under SDI, and in fact $56 million of our fiscal year 1986 budget is that pilot production line program.

If I were forced in an overall budget reduction to reduce this production line from the SDI, it would mean not only that SDI has a problem, but other defense programs that we are planning which would build on that capability would not be funded.

CROSS FUNDING

Senator **Johnston**. The point I was making is that so many of these individual technologies have applications elsewhere in the budget so that if Congress does not do what is right and just and smart and fund you in SDI, I hope you can do it from DARPA or elsewhere. I would expect that you would.

General **Abrahamson**. But only if DARPA is given the money. The point is that we have worked very hard to ensure that we do not have duplication in the budget. So many of these technology items are now fully funded in my program. If they are reduced, and I have to make those adjustments, there will not be funding in any other place.

Let me give you two further examples.

Right now our early warning and surveillance are provided by a set of satellites [deleted]. Those are operational requirements today and some of the highest priority programs within our Defense Department.

That makes our present retaliatory system work. We have to have that warning. It is necessary to upgrade those systems. Everybody knows that we need to be able to do that. We have to upgrade them even further than the upgrades that were previously defined as operational requirements.

However, they took the money out of the Air Force [deleted] and that is now in my line. In fact, [deleted] we not only have to have the technology developed [deleted], but we also have to have the system work done, otherwise we will not meet what would have been a completely separate operational requirement.

TERMINAL POINT DEFENSE

Senator **Johnston**. You are also saying there are great spinoffs in these technologies in other areas of defense and probably civilian application.

General **Abrahamson**. Yes, sir.

Senator **Johnston**. One quick question.

You talk about your robust first phase. I assume you are talking about your terminal point defense.

What would be a deployment date for that if you wanted to do it and what would be the parameters of cost?

I know you have not costed it out, but when and for how much could we have some of those systems in place?

General **Abrahamson**. A terminal system?

Senator **Johnston**. I assume that is what the robust first phase is?

General **Abrahamson**. No, sir; you have struck on a very important point. That is why I tried to emphasize with the homing overlay experiment that what we demonstrated was not merely a terminal kind of system.

What we domonstrated was a more mature technology that could be applied at several layers. The real advantage of the architecture that we are talking about is the multiple layered approach.

Remember, I indicated that the Soviet terminal defense, even nuclear, which is more potent and can perhaps knock our several warheads with one system as opposed to ours, is the kind of system that is intended to take care of a ragged retaliatory strike.

[Deleted.] We feel that we must be able to emphasize a layered defense, and while one might include as one of several layers a terminal or terminal area system, I think that that would be provocative enough plus not meet our overall objective that we would not at this point recommend that we proceed with that alone. We feel that we have to be able to couple that with a boost phase system.

The boost phase is where you get the real leverage on this. That is so important that there have been people that have suggested that.

BOOST PHASE

Senator **STEVENS**. Explain that.

Why is boost phase so much more important?

General **ABRAHAMSON**. If you can knock out one SS-18 today, sir, you are destroying 10 warheads. You are preventing them from deploying what might be hundreds of decoys which complicate your problem.

So, you get great leverage.

Further than that you get a multiplication of probability. Remember, we are trying to build this system to prevent war and trying to force the Soviet planner into such a level of uncertainty that he would not be able to go to his boost and say, I think that it is worthwhile for us to strike even under exacerbated conditions of crisis.

Let me show you the difference. A Soviet planner today has only got to consider three things in terms of his willingness to strike and his knowledge of how effective that will be; his own missile's reliability, his own missile's accuracy, and that is the second one, and he knows that because he shoots lots of them, he shoots a lot more of them than we do.

So, he knows how good they are and he knows how accurate they are.

The only other piece of information that he needs, is how hard is the target. If he wants to go out to a Minuteman site, he can get out in a cornfield or fly over with a light airplane and take a picture, the size of the concrete, and figure out how many warheads he has to put on that target and he does.

We know that essentially they put [deleted] warheads for every one of our hard targets. For our soft targets, like a port that would resupply Europe or one of our airfields, he puts [deleted] warheads. That gives him plenty of confidence that he is going to destroy that target.

Now, if you have a layered system, he doesn't know which of his missiles is going to get through that first layer. If you have a second layer, even if he could begin to predict by trying to saturate the first layer, he would never know which of the missiles go through the second.

There is a very interesting probability calculation you can make. What happens is in order to get over a single layer system he only has to add two or three or four, but in order to maintain confidence in his other systems, he may have to add hundreds of warheads in order to be able to overcome a three-layered system.

FIRST PHASE

Senator **JOHNSTON**. when you talk about first phase, robust phase, I understand we are not talking about terminal defense, but at least you are talking about point defense, aren't you?

General **ABRAHAMSON**. No, sir; I believe that of all of our most mature technologies, if the Congress and the President said for some reason we had to go right now for an operational system, [deleted].

I think point defense is so easily saturable that it is not an effective system by itself.

DEPLOYMENT DATA COST

Senator Johnston. What kind of cost in deployment data are we talking about?

General Abrahamson. ~~We have~~ not calculated that because we are trying to force those down.

Senator Johnson. More or less than 1 trillion?

General Abrahamson. Substantially less than 1 trillion.

The Russian estimate is 2½ trillion. The Russian estimate is based on the same calculation that the Union of Concerned Scientists made about the number of directed energy weapons.

Those calculations have already been refuted several times.

Senator Johnston. Can you give us any parameters for the first phase either in date or in cost? I know it has to be a big tolerance.

Senator Stevens. That will be your last question, Senator.

General Abrahamson. We are trying to bring forth the technology in a way that you can do it. Let me talk about the point.

In every case the long pole in the tent will be the command and control system. That is where we have to do a lot more research and development of new techniques to be able to build that quickly and capably.

Frankly, I don't think I have a good enough handle on that to say. I believe we are going to make a great deal of progress, but the command and control system depends so dramatically on what some of those weapons are and what the requirements are for pointing at the target trajectory.

I do believe we could be ready for decision in the early 1990's. It is not an unreasonable thing to expect [deleted].

Senator Stevens. Senator Chiles.

SDI FUNDING TO U.S. ALLIES

Senator Chiles. General, what can you tell us about what we have heard from the President and Secretary Weinberger about the proposition to shower some of their money on our allies if they sign on in the next 60 days?

General Abrahamson. Sir, we respectfully point out we did not mean shower in the process. I know and I made that point last week in Europe, because I think we have to be very straightforward about this, that this is not major jobs program or the kind of thing that a production program would generate.

What we are talking about are many, many small projects where we are looking for some of the best capability in the world to help us.

In some cases the Europeans are already helping us because they have some facilities and some capabilities that we don't have.

It would cost us money or take time to do that. Let me give you an example.

One of the concepts we are pursuing is called the free electron laser. The details of that are not important, but it uses a radio frequency driver to make it work. Those drivers are very, very large Klystron types, the kinds of tubes we used in our very large radars and we have now progressed beyond them. We don't make them in this country any more. Only Thompson CFS makes it. We will probably buy that from them.

The most accurate pointing and tracking system in the world today is an experiment-oriented system as opposed to a weapon development, and our problem now is in experiment, is the intrument pointing system that I was responsible for overseeing from NASA's viewpoint as it was developed by Europe, primarily by Dornier in Germany.

We are examining that system to see if some minor upgrades to that could allow us to save money and to find a way to improve our pointing and tracking. [Deleted.]

SDI FUNDING IN EUROPE AND JAPAN

Senator **CHILES**. Can you tell me how much money we are talking about putting in Europe and Japan?

General **ABRAHAMSON**. No, sir; we can't. We have informed our European allies and people who may be interested, that there is not a large amount of money.

What they should expect is that we are looking for specific technology areas that they could help us in. They are probably small, but important technology areas.

In Europe the step that several countries are now embarked on is to examine where they think their technologies could contribute, what areas they are interested in and where they have some excess capability.

We will compare that as a second step with what we need and then find ways in which we can try to do the research as quickly and as inexpensively as possible.

There are some important policy reasons over and above the technological reasons for engaging our European allies in this work.

One of those is that at some time downstream as we examine the progress in the technical program it will probably be a [deleted] decision on whether or not one deploys. We think it is important for them to have confidence in that research and an understanding of it, so that it can be a unanimous kind of thing that we would progress on.

Surely some money would go there, but I am not in a position——

Senator **CHILES**. You can't tell me whether it is 20 percent of what we are talking about or 15 percent?

General **ABRAHAMSON**. No, sir; not until we get expressions of interest from them and until we look very carefully at where their capabily can complement ours.

In some cases they may be interested in putting up some money of their own as well.

Senator **CHILES**. That is all. Thank you.

Senator **STEVENS**. Thank you very much.

I remind members we are going to have an open session.

We are about ready now to go into the code word session.

SUBMITTED QUESTIONS

Does anyone have questions for the General beyond what we have been able to handle in this secret session? Does anyone have such questions?

Senator McClure. I want to get into this question about treaty violations and treaty compliance on both sides.

Senator Chiles. Thank you.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

ADDITIONAL COMMITTEE QUESTIONS

Competition for SDI Systems Architecture

Question. Please describe to the Committee the so-called "horserace" that has been initiated between ten different contractors competing for development of the SDI systems architecture.

Answer. The system architecture and key trade-off study, commonly called the horserace, is an innovative acquisition strategy utilizing current procurement regulations. For a firm fixed price, contractors are given incentive to work with quality and speed to produce a product by a not earlier than (NET) date. Upon submittal of their results in Phase I a government evaluation team will determine if their results are acceptable. If the results are acceptable the government exercises a Phase II option. There are ten contractors and only five options will be exercised. If a contractor submits late with an acceptable product he runs the risk that the government will run out of option funding, thus contractors have an incentive to invest some of their own funding, to augument government funding to produce a quality product as soon as possible.

Question. How many contractors are in the "horse-race"? When will results from the studies being conducted by the ten horse-race teams be available?

Answer. There are ten prime contractors when counted with subcontractors represented about 65 companies participating in the development of SDI system architectures. The results from phase one will be available in September 1985.

Question. How many contractors will then be kept in the horse-race to prepare a more detailed follow-on SDI systems architecture studies?

Answer. Five contractors will participate in a more detailed Phase II study. A separate competitive content will be awarded in the beginning of FY 87 that selects one contractor to continue as the SDI system architect.

SATKA Portion of SDI Program

Question. The SATKA portion of the SDI program pursues technologies required in order to initiate the defense engagement and discriminate between ICBM reentry vehicles, decoys and other penetration aids. You are requesting $1.4 billion for SATKA related projects, an increase of $840 million from FY 1985.

Isn't the SATKA portion of SDI really a long-term development, more so than the weapons programs?

Answer. Like all of the Program Elements which comprise the SDI, SATKA includes some efforts which are long-term in nature and some which will be available sooner. The percentage of efforts in SATKA which are long term (i.e. would not be available for deployment before the year 2000) is roughly equivalent to that of the other Program Elements. SATKA is developing technology for three timeframes; those applicable to near-term SDI architectures, mid-term technologies for later application or as a second generation capability, and far-term technologies. The far-term technologies are generarally the high research efforts which, if successful, will provide extremely valuable, advanced capabilities.

Question. What are some of the key discriminating and imaging technologies being pursued in SATKA?

Answer. Discriminating is one of the key areas in which SATKA is performing research. Generally discrimination can be considered in three general categories: passive, active and interactive.

With passive discrimination techniques sensors attempt to measure some fundamental parameter associated with the object and draw conclusions about the object's identity from these measurements. Thus an IR sensor might measure the change in an object's temperature as it moves from darkness into sunlight and based on this data form a conclusion about its identity. In another example a senosor might measure deceleration as the object enters the atmosphere and use this data to discriminate. This type of discrimination is generally within the state-of-the-art, although advances in sensor technology and improved algorithms will increase our capabilities to perform passive discrimination. SATKA in funding efforts in such areas.

Active discrimination is generally defined to include those technique which develop images of the object. In imaging a radar or laser beam illuminates the object and the reflected energy is used to develop an electronic "picture". By comparing selected features (e.g. size and shape) of this image with other "pictures" of known objects it is possible to identify the object being illuminated. Radar and laser imaging is currently possible but the time required for a computer to process the data and develop the images is ofter measured in hours. For this capability to be useful in a tactical situation real or near-real time processing is required. The SDI is supporting efforts to increase the computing capability, to develop the requisite laser and rader technology. Advances in all these areas are necessary before real-time imaging will be possible. The final type of discrimination, interactive, uses a source of energy, such as a laser or netral paticle beam, to perturb the object under consideration and them uses a measurement of the result as the discriminate. Thus a high power laser might be used to "slap" an object. Very light decoys would have a measurable recoil whereas heavy reentry vehicles would be largly unaffected. There are numerous possible energy sources which might be used for this purpose and for each there are a number of possible reactions which might be measured. This is the least understood of the three classes of discrimination; the SATKA and DEW Program Elements are doing research in many associated areas.

For any of these types of discrimination it is necessary to have an extensive data base describing the objects being observed. In particular, it is necessary to have made measurements on actual RVs and penetration aids in flight. SATKA funds numerous data collection projects which are gathering this information on both U.S. and Soviet systems. To be effective these intelligence efforts must interact with the technology development. As new discrimination techniques and hardware are developed, they are fed into the collection effort which in turn provides the data necessary for further advances.

Question. Do you intend to pursue all of these technologies through FSD, or downselect at some point in the development cycle?

Answer. The SDI is a research effort. We are not currently conducting nor planning FSD. We are doing research which will provide the data for a future President and a future Congress to decide if FSD is warranted. It is likely that this research will result in some technologies being indentified which have a greater potlential for SDI application and these might then be selected to enter FSD with the other technologies either being abandoned at that time or left in development. The extent of this down selection will be dependent upon the results of current and future research and cannot now be predicted.

Although elimination of major technology areas is not being considered at this stage of the SDI development, there is, in fact, a continual evaluation and redirection of our research efforts as progress is made. When a specific avenue of research proves unproductive, the effort is redirected elsewhere. Likewise we are watching for technological breakthroughs which will enhance our capabilities and will increase support in such areas as they are identified.

Question. 1. The SATKA program includes two important satellite development programs which are highly classified. One is (deleted) to detect ICMB launches in the boost phase; the other is system of space-based satellites to track mid-course space objects. These two programs are budgeted for a total of 267.1 million.

Are these programs ones we would want to develop even if we decided not to proceed with development of SDI? What are the requirements?

Answer. The Boost Surveillance and Tracking System (BSTS) and the Space Surveillance and Tracking Systems (SSTS) are SDI experiments designed to determine how various technologies might be combined and used to detect and track in the boost and mid-course phases, respectively. These satellities are being developed to satisfy SDI requirements for data to alert our forces and to provide designation and pointing for SDI systems. As currently envisioned, such SDI satellites would be capable of accomplishing collateral Air Force missions such as ballistic missile tactical warning/attack assessment, satellite attack warning/verification inherent in the design, not ones added at additional cost. If a decision is made not to deploy an SDI, the Air Force would still have these mission requirements but would have to make a determination how they were to be accomplished. Deployment of satellites such SSTS and BSTS is just one alternative which they would likely consider. If their decision was to use satellites the satellites would very likely be considerably less capable than those required to accomplish the full SDI mission.

AIRBORNE OPTICAL SENSOR FOR SATKA

Question. 2. The SATKA program also includes $191.6 million for the development of an airborne optical sensor for use in late mid-course and terminal phase detection. The airborne platform is to be a Boeing 767 aircraft.

How important of an element is this airborne system in the overall SDI architecture? Could it be eliminated without damaging your baseline SATKA program?

Answer. The Airborne Optical Adjunct, or AOA, is an extremely critical element of our overall SATKA effort. Like our other experiments, this effort is designed to learn how technologies can be combined to solve the SDI problem. In the case of AOA, there are major technological issues associated with Ir sensors, on-board computers and the aero-optical effects encountered in the atmosphere which can only be answered by such an experiment. The results of the experiment will greatly influence the eventual role an airborne optical system will play in an SDI architecture. Our preliminary analyses, however, indicate that it is an extremely important element of the terminal phase of any defense. In order to protect the soft targets (as opposed to hard targets such as missile silos) it is necessary to kill reentry vehicles at a very high altitude. To accomplish this requires the capability to acquire the targets earlier than is generally possible using a fixed radar. This would be the mission of a tactical system based on technology developed in the AOA experiment. Using the advance information acquired by such a system, a terminal radar would then be capable of handling a large number of RVs and associated objects, performing the required discrimination, and directing interceptors in a timely manner.

The AOA capabilities appear particularly promising for defense against submarine launched and tactical ballistic missiles. These shorter range systems will stress our reaction time and will probably be less vulnerable to the earlier tiers of a SDI defense. In a defense of our Allies (especially in Europe) AOA-like system may be the single most important element.

AOS DEPLOYMENT

Question. 3. Would deployment of AOS violate the ABM Treaty?

Answer. The AOS is a CONCEPT for an advanced airborne optical system which would incorporte a laser ranging device. The current AOA research effort has been examined in detail and does not violate any portion of the treaty. There are currently no plans to develop and deploy an operational AOS system. Funds have been requested to identify and then develop technologies which would make AOS system possible. These research efforts have been examined and do not violate the Treaty. Each SDI program is being examined repeatedly to insure that it does not violate this treaty.

Question. 4. You also are funding a ground-based terminal imaging radar, which leaps from $6 million last year to $74 million in FY 1986.

Will this terminal imaging radar be capable of tracking a greater number of objects than AOS?

Answer. The terminal imaging radar (TIR) is another of our major experiments. This effort is moving from concept definition into the design and fabrication phase of the experiment. It is designed to examine very specific issues associated with a radar. The experimental system is not designed for tactical deployment and, in fact, will use a commercially available data processor to reduce costs and schedule risks. The number of targets it can handle will be greater than the AOA with which it will eventually be tested. A tactical system would likely be capable of tracking several orders of magnitude more targets than this experimental device. To do so it would require a dedicated, specially designed data processor capable of handling the very large computing requirements necessary to detect, track and discriminate targets and penetration aids in real time. Such a system would be capable of interfacing with and tracking the objects passed to it by several of the postulated AOSs.

BATTLE MANAGEMENT RESPONSIBILITY

Question. Responsibility for battle management is divided between the Army and Air Force. The Army has ground-based terminal and late mid-course defense, while the Air Force is responsible for boost phase and mid-course battle management.

Does this division of responsibility effectively preclude any overlap in battle management roles and missions between the services?

Answer. Responsibility for Battle Management/Command, Control, and Communication (BM /C^3) is divided between the Army and the Air Force according to the following scheme, developed as a result of the SDIO program review conducted in June, 1985.

The Air Force will be the lead service in developing BM/C^3 architectures and concepts for operation for strategic defensive system alternatives that employ space-based weapon and sensor assets in harmony with a terminal defensive layer. The Army will be the lead service in developing BM/C^3 architectures and concepts for operation for strategic defensive system alternatives that are predominantly terrestrial in the placement of weapon and sensor assets, including the options that incorporate "pop-up" weapons and sensors. This new division of responsibility effectively precludes overlap in battle management system development roles and missions between the services; however, cooperation between the services is being required so as to make use of current expertise.

Mission roles in operating a future strategic defense system are still under study. The partitioning of development responsibilities, represented in the approach where "the Army has ground-based terminal and late mid-course defense, while the Air Force is responsibile for boost phase and mid-course battle management," is no longer in force.

Question. What are the major technologies required to support the battle management/command and control portion of SDI?

Answer. The major technologies required to support the battle management/command and control portion of SDI are computer science/engineering, communications, space science and mathematics.

Question. Battle management for SDI will be more complex than for separate Army BMD or Air Force programs.

What is driving the BM/C^3 program at this point—technology or a firm set of battle management guidelines?

Answer. The BM/C^3 program is being driven by the battle management guidelines, or requirements, as levied by the several alternative architectures for implementing a strategic defensive system.

In addition, technology opportunities showing promise of meeting these requirements have a serious influence over the efforts being funded.

Question. One of the identified BM/C^3 tasks (#4) is to develop protocols for an internetted communications system to support a multi-tiered SDI. This protocol development must support "real time communications with low delay, priority messages, self-diagnosing and self-healing capabilities, and dynamic loan balancing."

Just what does all this mean in terms of development of C^3 network for SDI?

Answer. The task that will develop protocols for an internetted communications system that must support "real time communications with low delay, priority messages, self-diagnosis, and self-healing capabilities, and dynamic load balancing," achieves the objective of communicating commands and data around the network in a timely fashion. The network supports real time computer processing requirements for tracking, discrimination, and resource allocation, but also allows interruption for priority command message traffic, such as from command authority. The network has the capability to detect faults or failures in its hardware and software and has the capability to "fix" these faults or failures. For example, it can reroute data and commands over alternate communication links between system assets. The property of dynamic load balancing reflects the need to use alternate routes for data and messages to avoid bottle-necks that may develop during the operation of the system. These are not unlike the technique of finding an alternate route to a congested freeway segment.

DIRECTED ENERGY WEAPONS PROGRAMS

Question. You are requesting $965 million for directed energy weapons programs, more than two and a half times the FY 1985 funding level.

Your request is broken into four projects—

(1) Space-based lasers, $371.9 million.

(2) Ground-based lasers, $431.5 million.

(3) Space-based particle beam, $133.4 million.

(4) Nuclear-driven concepts, $28.6 million.

What specific program goals and objectives are being pursued during FY 1986 in your laser programs that require funding to more than double from FY 1985? When will we be seeing some demonstrations?

Answer. The Directed Energy Weapons (DEW) program must have the necessary funding to enable it to proceed with the technology efforts designated to resolve the critical technical decision on whether to proceed to development and deployment of a defense against ballistic missiles. Funding reductions to the President's FY 1986 budget request will cause delays that will adversely affect DEW program goals, timelines, and tasks supporting the overall goal. As reported in Secretary of Defense

Weinberger's "Report to Congress on the Implementation of Congressional Reductions to the FY 1985 SDI Program Budget," (February 1985), the FY 1985 reduction has a clear effect of delaying the program. While we were generally successful in maintaining our overall program strategy in the FY 1985 reallocation process, the planned funding levels in FY 1986 have now become much more important so that we can continue the goals, timelines, and tasks of SDI.

There are three major thrusts of the SDIO that are designed to meet the needs of the 1990s decision: (1) validate the most mature technologies to provide initial options for deployment of a missile defense; (2) ensure the long-term viability of initial deployments by demonstrating the feasibility and readiness of concepts to support advanced options; and (3) perform research that encourages and challenges innovation. The Directed Energy Weapons Program will contribute to that decision by exploring promising directed energy weapons candidates.

Question. Would you describe your directed energy program as balanced between short and long wavelength laser technology?

Answer. Clearly yes. A balance exists within the Directed Energy program between short and long wavelength laser research. Each program is designed to advance the technology at a pace limited only by the capability to develop the technology. The differences in phasing and time of key milestones is a reflection of the fact that as late as 1980, the mid-infrared technology was as much as 10 years ahead of the short-wavelength technology. Slightly higher funding requests for the ground-based laser project will ensure that the level of technical knowledge for both short and long wavelength laser concepts will support early 1990s decision in both areas.

SPACE-BASED LASERS

Question. What is your funding break-out for space based lasers between long-wave length, short-wave length and free electron lasers?

Answer. The funding break-out for space-based lasers between long wavelength, short wavelength and free electron lasers is $153.5 million, $0.7 million, and $0.3 million respectively. Some of the short wavelength and free electron laser technology in the Ground-Based Laser Program is applicable to the Space-Based Laser Program.

Question. The [deleted] Alpha chemical laser—a part of the Space Laser Triad program—will be largely completed during [deleted] with actual testing beginning in [deleted]. We understand that the other components of a chemical space laser system, the LAMP mirror and LODE optics, will also be essentially completed in [deleted].

When will you begin testing the various components of a space-based laser system at power levels representative of a genuine weapons system?

Answer. Assuming "representative of a genuine weapons system" means the actual power, aperature, and pointing stability of a weapon, we will probably reach that level in full scale development [deleted]. Prior to that we have the opportunity to hold down costs by using demonstration levels that are scaled down from the operational system. For example, ALPHA, LODE, and LAMP are the major space-based laser experiments that, collectively, will determine the scalability of key technologies to operational performance levels. Finally, in both ground- and space-based laser concepts, we are investigating approaches in which lower performance modules are combined to provide operational performance levels.

Question. What are the technical impediments to successfully developing and testing on the ground components of a [deleted] space-based laser weapon?

Answer. We need to provide evidence of technical feasibility and verified design practices for the major subsystems of such a weapon—a high efficiency hydrogen fluoride (HF) chemical laser in a space compatible configuration (ALPHA); precision optics to shape, correct and transfer the beam from the beam generator to the output telescope (LODE), a precision telescope with a very large primary mirror (LAMP) to focus the beam on the target; and a high precision acquisition, tracking and pointing (ATP) system to maintain the beam on the target with a minimum amount of beam-smearing jitter. Of course, integration of these complex systems and testing with enough confidence that they will perform their mission in an operational environment is most usually a difficult and major technical accomplishment. However, research to discover and overcome potential impediments is progressing at favorable rates in all areas.

Question. At this point, which technology is more mature, long wavelength or short wavelength lasers?

Answer. Long wavelength (infrared) laser technology is more mature.

SHORT WAVELENGTH LASERS

Question. Will short wavelength lasers have to be "scaled up" to usable megawatt power levels? How is that progressing?

Answer. Current laser technology research and experimentation projects do not require fabrication at operational power levels to give us confidence that the lasers will operate at those levels. The projects are designed to give us confidence in the technical feasibility of scaling to operational power level requirements in the future. At the present time, we are meeting our program goals.

GROUND-BASED LASERS

Question. Your budget request of $431.5 million for ground-based laser concepts is $60 million more than your request for space-based laser concepts. Many of the ground-based concepts involve the use of the short wavelength technologies, such as free-electron, visible/ultraviolet, blue-green and excimer.

Can all of these ground-based projects you are proposing for substantial increases in FY 1986 efficiently use all this R&D money?

Answer. Yes. The ground-based laser (GBL) program is based on a legacy of development planning and development efforts that pre-date the President's Initiative. FY 1986 is a critical year for getting the program on track to meet the overall goals of the program to support an early 1990s decision on whether to develop and deploy ballistic missile defenses. The ground-based laser project includes two major device efforts, the excimer and free electron laser (FEL). [Deleted] are being explored as opposed to the single chemical laser involved in the space-based laser program. Futhermore, these technologies are less mature than the long wavelength concepts associated with the space-based laser program. The GBL program also requires the development of advanced technologies in optics, beam control, atmospheric compensation and space relay mirrors. The budget request is essential and usable if we are to enable the GBL project to reach our goal for providing options for a 1990s decision.

Question. How long will it take before we know if the required pointing and control technologies for short wavelength lasers can be adapted to weapons applications? Isn't keeping the laser beam on the target a major concern here?

Answer. The technology development activities will coverage on two major demonstrations that will provide the evidence required that acquisition, tracking and pointing (ATP) accuracies we need can be achieved. [Deleted.]

Question. Your ground-based laser program includes an early 1990s test of a high power up-link demonstration using a diagnostic satellite in low earth orbit.

Can you explain this demonstration in a more general way, and explain when we might be ready for a "full-up" systems demonstration of ground-based lasers using space relay mirrors?

Answer: The Integrated Technology Up-link Experiment (ITUE) [deleted]. The purpose of this experiment is to demonstrate [deleted]. The experiment will use proven technologies resulting from the current R&D investment. The core of the effort is [deleted]. This demonstration is presently in the planning stage and the possibility exists that [deleted]. An experiment using elements more closely resembling an operational system [deleted], but probably at reduced power levels. Portions of that experiment would have to be conducted [deleted]. Such an experiment would be the outgrowth of decisions in the early 1990s regarding whether or not to proceed with such development. Once that decision is made, a "full up" validation of the ground-based laser technology could occur in the mid 1990s.

ARMY INTERCEPTOR PROGRAMS

Question. 1. General Abrahamson, you have three interceptor programs managed by the Army—HEDI, ERIS and SR Hit——that make up nearly one-half of your FY 1986 Kinetic energy weapons, some $430 million. These interceptor programs are different from previous Army ABM interceptor programs in that they are non-nuclear.

Are you confident that the necessary warhead, fuzing and acquisition technologies can be developed to make non-nuclear kill for these interceptors a reality?

Answer. Our program will efficiently and scientifically resolve the present technical issues associated with NNK interception of SDI targets. We are confident that such performance is possible—the genius comes from achieving the required performance at low cost.

Question. 2. You are trying to develop the ERIS interceptor without a warhead—strictly hit-to-kill. Can you achieve the acceleration necessary to kill without a warhead?

Answer. Acceleration is not required for ERIS to negate an RV. The relative velocity between RV and ERIS is sufficient to generate impact energies exceeding that generated by a truck hitting a brick wall at 60 mph.

Question. 3. Does the SDI effort include any "hedge options" for deployment of nuclear warheads if the non-nuclear kill technology arrives later than we now anticipate? Or is the nuclear option strictly out?

Answer. The SDI effort does not include a "nuclear hedge." Nuclear warheads for BMD have been developed and designed and are available if a "hedge" is required.

Question. 4. When will the first flight tests of the HEDI (high endoatomospheric) and ERIS (exatmospheric) interceptors? Could they be accelerated?

Answer. HEDI will fly in 1990 and ERIS will fly in 1989. The schedules could be accelerated somewhat (6–12 months) through intensified effort.

Question. 1. Another interceptor being developed for low endoatmospheric defense is SR Hit. SR Hit is a small radar-homing interceptor.

We understand that SR Hit is being tested in miss distance experiments against fixed and moving ballistic targets.

What have the preliminary results shown so far?

Answer. The results have indicated that the SR Hit can fly to a point in space and maneuver laterally to make up for pointing inaccuracies. SR Hit has not yet flown with the mm wave radar which allows home-on-target guidance.

Question. 2. Last year, the Army successfully located and destroyed an incoming Minuteman RV with the Homing Overlay interceptor. The HOE, launched from a Minuteman booster, unfurled an umbrella-like 15 foot-diameter net at the Minuteman RV while traveling at 20,000 miles per hour above the atmosphere. But HOE itself has been terminated.

What components of the HOE program are being retained for the new exoatmospheric interceptor program, ERIS?

Answer. All the technologies validated by HOE will be available for ERIS. The specific components built for the HOE program were expended during the experiments. If an ERIS contractor desires to obtain HOE components, it can either purchase them from the HOE contractor or build them itself. Hopefully, the component technologies will evolve with ERIS such that a significantly reduced cost per kill will result.

Question. 3. As we phase out 100 of our Minuteman IIIs for deployment of MX, could their boosters be used for possible deployment of HOE-type interceptors? Is this a part of the SDI program? Why or why not?

Answer. MMIII boosters could be used to deploy HOE-type interceptors. Since SDI is not a deployment program, the SDIO does not intend to obtain MMIII boosters for retrofit with HOE interceptors. SDIO is in the research business only—the Army has already done the research on HOE.

SDI Space Power Requirements

Question. The space power requirements for SDI appear challenging. These requirements are estimated at [deleted] for weapons applications. What major events are occuring in this field during FY 1986?

Answer. Providing the necessary power to execute the SDIO mission is indeed a major challenge, particularly for space-based assets. Solar arrays account for nearly all of the spacecraft power used today, but SDIO rquirements are orders of magnitude greater than current practice. The Defense Technologies Study and preliminary SDIO studies have concluded that solar arrays will be incapable of satisfying SDIO needs. The space power project is aimed at developing the enabling power generations and conversion technologies to the point that the feasibility of producing large quantities of specially-conditioned electrical power for weapons platforms and surveillance functions is established by the end of FY 1991. The major issues to be resolved include power and voltage capability, affordability, mass and volume, survivability, space plasma interactions, and payload compatibility (i.e., vibration, stability, effluent contamination.

The Space Power Project consists of three major activities: (10 the joint SDI/NASA/DOE SP-100 program, (2) Multimegawatt (MMW) prime power technology development, and (3) pulse power conditioning technology development. The SP-100 space reactor power system was transferred from DARPA to SDIO in October of 1984, and has progressed on schedule through the technology assessment phase. The major events for FY 1986 are the solicitation and award of a contract to design and develop the major SP-100 subsystems for ground testing. The RFP will be issued through DOE during the first quarter, and the contract will be awarded during the fourth quarter.

Due to limited funding ($3M), FY 1985 has been a planning year for both the MMW and pulse power technology programs. A broad spectrum of MMW power system concepts has been solicited from industy, universities, and Government laboratories, and an Independent Evaluation Group has been formed to assess the potential payoffs of these systems and to identify feasibility issues and technology needs. Assuming the requested funds are appropriated, the primary milestone in FY 1986 is to narrow the number of potential concepts to five or six, so that the available resources can be focused on options with the most to offer. Both nuclear and non-nuclear systems are under consideration for MMW prime power.

The pulse power conditioning activity is directed at solving the feasibility issues associated with forming the precise power profiles required by the weapons concepts. The major problems are related to space plasma interactions and the need for order of magnitude improvements in component capability and in mass and volume densities. Early in FY 1986, RFPs or similar solicitations will be issued for several technical development efforts.

Space Nuclear Power Funding

Question. To what extent are you funding space nuclear power as a portion of this program?

Answer. A number of studies indicate that the nuclear option appears to be the only logical choice for long-term continuous or semi-continuous power at the levels required by SDIO. For nearly all of the SATKA missions and for the housekeeping power on the weapons platforms, the power range offered by the SP-100 technology is ideally suited. In addition, a combination of SP-100 and some form of energy storage may be feasible in multimegawatt (MMW) power. Consequently, $16M of SDIO funds are committed to the SP-100 program in FY 1986. It may be possible to provide burst mode MMW power with either nuclear or non-nuclear systems depending on our ability to solve the major feasibility problems associated with each type of system. The funding for MMW nuclear technology will be in the range of $10M to $15M in FY 1986.

Question. Your particle beam program climbs to $133.4 million, more than four times the FY 1985 funding level of $32.2 million.

What is driving this major acceleration in your neutral particle beam program?

Answer. The particle beam program is designed to support the SDI goal of an early 1990s decision on whether to proceed to development and deployment of a ballistic missile defense. The particle beam program is designed to support this decision by [deleted] and the acceleration is necessary to meet that goal.

The basis for expansion of the particle beam program is nearly a decade of development activities. Three areas drive the FY 1986 acceleration. First, the Accelerator Test Stand (ATS) (currently producing [deleted] is expected to [deleted]. This requires drift tuble linac sections to be installed on the ATS and a new ion source and accelerator cooling system to be assembled in a separate test stand to permit continuous operation at [deleted]. This is, in essence, the first major step into design of the [deleted] ATS Upgrade (ATSU). Second, the program will begin expanded efforts in other key subsystems and technology—beam control, pointing, beam sensing, light weighting components, etc. Third, Concept and Development Definition activities in the area of technology identification should be completed in FY 1986 to provide the needed insights into the technology content of such systems to guide the overall technology development efforts.

Neutral Particle Beam Concept

Question. With the FY 1986 budget, will you be able to establish the feasibility of the neutral particle beam concept for space?

Answer. The first major rocket experiment is expected to occur in FY 1988 with a [deleted]. Given the current success of the Accelerator Test Stand (ATS—a ground-based demonstrator producing a beam energy of [deleted] we are [deleted] that the feasibility of the neutral particle beam concept for space can be demonstrated by [deleted].

Accelerator Test Stand (ATS)

Question. An upgrade is being proposed for the Accelerator Test Stand (ATS). The linear accelerator will (deleted).

What is the requirement for demonstrating a (deleted) capability on the accelerator test stand?

When will the ATS upgrade be completed? What is the total cost of the upgrade? What is the cost of the upgrade for FY 1986?

Answer. The Accelerator Test Stand (ATS) is an experiment designed to demonstrate scalability to space operation of a neutral particle beam weapon and readiness to proceed to system level development. It is not a prototype weapon. A level at (deleted) operation is considered to be an important part of the (deleted) for high confidence in making decisions regarding the development of a system. Operation at (deleted) is considered to be a reasonable level for (deleted) regarding the beam and for testing elements representing those (deleted) in space.

The Accelerator Test Stand Upgrade (ATSU) effort is part of an evolutionary program that will increase the capacity and performance of the ATS by a series of upgrades. It currently produces (deleted). In the FY 1985 neutral particle beam (NPB) program, drift tube linac sections is being installed on the Accelerator Test Stand and the (deleted) beam will be produced. The first major effort in the design of the ATSU will commence at that time also. Work will continue on the development of a (deleted). Research will also begin in (deleted). With the demonstration of the (deleted) on the accelerator test stand (ATS) in FY 1986, the (deleted) neutral particle beam concepts (deleted). With the completion of this phase, the final design of the Accelerator Test Stand Upgrade (ATSU) will be fixed. (Deleted.) ATSU will use a (deleted). The construction of the (deleted). The design and fabrication of the (deleted) is continuing. The ATSU is planned to be completed in (deleted) with full facility operations to commence in (deleted).

Cost of the neutral particle beam task that includes the ATS as the major experiment is projected at $74 million in FY 1986. The portion of the cost for the ATSU in FY 1986 is $15 million. Cost of the upgrade through 1989 is $64 million.

HYPERVELOCITY LAUNCHER TECHNOLOGY AND DEVELOPMENT

Question. 1. General Abrahamson, you are asking for $68.7M for hypervelocity launcher technology and $39.3M for hypervelocity launcher development.

Could you describe the key technologies and systems concepts of the hypervelocity gun?

Answer. The key technologies in the hypervelocity gun program are asociated with the launcher and projectile, respectively. The launcher must be space compatible, generate many megajoules of energy, deliver that energy efficiently to the launching medium (rails, barrel, etc.), and survive to launch again. The projectile must be small, inexpensive, capable of surviving tremendous acceleration, and accurate at long range. The system concepts include space-based boost and post-boost phase defense, as well as ground-level terminal phase defense applications.

Question. 2. Are they really mature enough for this large influx of money, some five times last year's level of $22M?

Answer. The achivements in EML technology have been significant over the past 4 years, with projectile velocities, switch and power supply performance, and high-g electronics survivability approaching the parameter space required for SDI application. They are certainly mature enough for the recommended program.

Question. 3. Would this system be used as our primary mid-course weapon? Or could directed energy weapopns still satisfy that mission?

Answer. It has not been determined which weapon would be primary. The inherent lethality of KEW's make them especially effective against RV's so if a DEW was not hyper-lethal against the RV, the KEW would probably be the optimal weapon.

Question 4. Would you describe this as of lower priority than your HEDI, ERIS and SR HIT programs?

Answer. The overall priority of hypervelocity launcher technology cannot be assessed in relation to HEDI, ERIS, and SR HIT. Decrements in the budget would have to be assessed in toto and the impact of the decrement studied in terms of its impact on each element of the KEW Program. For example, it might be more advisable to delay ERIS for a few months than to stop the hypervelocity launcher technology effort in 1986.

Question 5 and 6. You have a project in the KEW program called "Novel Concepts." The budget request for novel concepts is $29.5M, an increase over $20.5M over FY 1985.

Is this a high risk project?

One major project is that of light, ground-based projectiles launched at 100 kilometers per second.

BEST COPY AVAILABLE

Do you think it is still technically feasible to get *light* projectiles to achieve those kinds of speed?

What kinds of power sources are required?

Answer. The line formerly called "novel concepts" is associated with research in advanced KEW technologies. Higher payoff albeit higher risk projects are considered in this part of the program. Velocities of 40 km/sec have already been achieved, so the idea of 100 km/sec projectiles does not seem to be so hared to accept. Power sources of these launchers are the same as those for heavier, slower hypervelocity launches.

Question 7. Are the Soviets doing work in this area?

Answer. The Soviets have been pursuing substantial research effort in the area of launcher devices and associated power supplies and switches for over the last 2 decades.

COMMON TECHNOLOGY AND ARCHITECTURE

Question. 1 The SDI program now includes a large $250 million project to develop and demonstrate the technologies associated with on-board signal and data processing for SATKA missions. Included in the Common Technology and Architecture program are efforts to develop pilot production lines and work out manufacturing processes.

The principle technologies being pursued are hardened LSI and gallium arsenide.

Why is there requirement to establish pilot production lines in the mid-1990s for these technologies to support SDI?

Answer. Large scale integrated (LSI) digital and analog circuits are an integral part of almost every system concept being considered by the SDI. These chips are inherently susceptible to radiation which can introduced false signals or render the entire circuit inoperative. Efforts have been underway for many years to "harden" or make the chips less susceptible. SATKA is working on two particular areas: hardening the bulk silicon chips currently produced and developing a new family of circuits based on a gallium arsenide (GaAs) substate (which is inherently less susceptible to radiation.)

The process of developing LSI circuits involves "growing" crystals, which are the basic building material of the chip, in a very highly controlled environment. Physical conditions (temperature and pressure) and the composition of the growth medium must be very carefully controlled and must be repeated exactly for each successive item in order to obtain consistent results. Producing a single chip in the laboratory environment is relatively easy but the need to control processes makes production line operations much more difficult. Pilot production lines are used to develop these capabilties. After setting up the facilities, samples are produced under controlled conditions. The process is then varied and the effect of these changes are determined. This process is continued until an optimum is reached. The entire effort may take several years of work before the process is refined to the point that chips are produced reliably. In order to have chips available when needed, it is necessary to start such pilot production lines in the 80s.

Question. 2. Are these technologies required for demonstration in certain SDI system? Which systems?

Answer. All SDI systems will require electronic circuits which have been hardened to withstand radiation. The space-based elements of SDI must operate in the natural radiation present in space and all of the systems must be designed to operate in the intense radiation which will exist after nuclear detonations. Our current experiments, commonly called demonstrations, do not require the same levels of hardening which tactical systems will require; but, in many cases, particularly for space-based experiments, they must be hardened to some degree. In particular the Space Surveillance and Tracking System (SSTS) and the Boost Surveillance and Tracking System (BSTS) experiments will require hardened LSI circuits. The limited number of chips produced by the pilot production lines will satisfy these requirements.

QUESTIONS SUBMITTED BY SENATOR STENNIS

5-YEAR COST OF SDI

Question. What is the total cost of SDI for the next five years? Please provide planned costs by fiscal year for each program element. Please identify costs in the DOD budget, as well as in other government agencies.

Answer. DOD policy requires that outyear FYDP data is for internal use only.

	Fiscal year—		
	1985	1986	1987
SATKA	$1,386,344	$1,874,923	$2,578,165
DEW	965,441	1,195,575	1,349,351
KEW	859,724	1,238,569	1,475,699
SABM	243,300	272,527	305,382
SLKT	258,153	316,701	446,107
Total SDI	3,722,184	4,908,297	6,164,942

Question. In your statement (Page 5), you say that the SDI research and technology program ". . . must provide confidence that the candidate defensive systems are affordable. Since affordable. Since Affordability is a matter of cost, how much would an affordable system cost?

Answer. Speculating on the probable cost of a yet-to-be defined defense program would be premature. At this time it is impossible to assess all the factors that would contribute to the overall cost of the program. However, as we proceed with Phase Two of our architecture study definitions of potential costs will be more accurately assessed.

SPACE LOGISTICS

Question. In your statement, you indicate that your efforts in space logistics will be "to reduce costs significantly." (Page 10) What are the current costs associated with space logistics? How much might it cost to deploy a hypothetical system using current technology?

Answer. It is difficult to obtain precise cost data relative to space logistics. The figures for space transportation along varies from two to four thousand dollars per round of payload to low earth. For discussion purposes, we are using a cost of $3000/pound for transportation.

Question. What are your goals in terms of cost reduction?

Answer. Our goal is an order of magnitude cost reduction in space transportation.

Question. What other research efforts are directed at technology to reduce costs? What is the current cost experience, and what are your goals?

Answer. The cost figures described above are associated with operations created in an "expendable" environment. The space boosters were generally modified ICBMs or their derivatives. The Shuttle offers us the first opportunity of a reuseable space transportation system. It is apparent that the critical variable in determining space transportation architectures is the mission model. The traffic dictated by the mission model plus the available funding will direct the capital investments in the space transportation architectures. As an example, neigher the mission model nor the allocated funding were sufficient to acquire a totally reuseable space shuttle. Also, like the launch vehicles, the spacecraft themselves were designed in an "expendable" environment. This expendable environment dictated an extreme degree of reliability, redundancy, checkout, and testing. Additionally, the development and acquisition of the spacecraft has generally been on very limited orders, another factor which has contributed to the apparent high cost of space operations.

Our approach is to address the total infrastructure of space operations with the goal of cost reduction. We want to exploit the ground operations segment: investing in manufacturing, built-in test equipment and fault isolation, standardization and modularization of components, and reduction in software for verification analyses and mission control. The on-orbit operatons is a relatively unexploited arena. With the advent of the shuttle we can now begin to look at on-orbit assembly of large structures, maintenance, servicing repair of the spacecraft, storage and depot facilities, and transportation hubs using inter- and intra-orbit vehicles. The realization of these opportunities will transforn the space operations from an "expendable" environment to a "reuseable" one. The analogy is to make future space operatoins comparable to today's commercial airline operations.

Question. There have been reports that some SDI study efforts, jointly funded by the Air Force and NASA, are under way. Please identify current and projected jointly funded projects and the costs that are required to meet SDI goals. What funding assumptions over the next five years have been made about support of SDI research goals from non-SDI funds? Please provide estimated costs.

Answer. The SDI is participating with the Air Force and NASA in the National Space Transportation Architecture Study directed by the NSC. Space Transportation is viewed as a national program and is being supported by all current and future users. The SDI is funding those activities associated with SDI-unique requirements.

FOREIGN FUNDING OF SDI COSTS

Question. Your SDI program proposes to provide strategic defense options for both the United States and its Allies. How much funding support for SDI do you expect from our allies? Please provide specific numbers.

Answer. We would be pleased if any allied government felt it could supplement U.S. funding for SDI research with its own. That would allow us a more vigorous cooperative effort, increasing the mutual benefit of SDI research and decreasing the time required to conduct it. Financial contributions, however, would not be a precondition for any nation's technical participation in SDI research, nor for the firm commitment of the United States to ensure that any defenses against ballistic missiles which we eventually decided to deploy would defend our allies as well as ourselves. The President has made that commitment clear since he first announced the Strategic Defense Initiative on 23 March 1983.

FY 1985 CONGRESSIONAL REDUCTION TO SDI

Question. In your statement, you say that you were generally successful in meeting your overall strategy of maintaining original program goals, time lines and tasks, when applying the budget reductions of $377 million made to the 1985 program. Were any major program goals, time lines and tasks set back by the 1985 Congressional adjustment?

NEAR-TERM DEPLOYMENT PROGRAM

In your statement, you indicate that the pace of the SDIO research program is being geared to allow decisions as early as the 1990s on whether to deploy advanced defensive options to the point where U.S. leaders, after consultation with our Allies, could make decisions on whether or not to proceed to the system development phase and subsequent deployment. (page 7)

These statements suggest that the highest priority effort is to support a near-term (1990s) deployment decision. Please identify the programs/projects in the 1986 budget which support this near-term effort.

Which of these program are pacing programs—that is, which determine the earliest date on which a deployment option would be made?

Answer. The effort to support a near-term (1990s) deployment decision does not encompass only certain "high priority" SDI programs/projects but, in fact, is the focal point for the entire initiative. This milestone, together with available resources, establishes the scope and pace of the SDI Program by focusing various research projects on a common goal in a logical and timely way. To support a potential 1990s decision, the Strategic Defense Initiative Organization must provide the President and Congress assurance that (1) an effective, survivable and affordable defense can be developed and deployed from proven technology, and (2) that there are feasible technologies which can sustain the defense deployment in the face of an expanding and responsive threat. Accordingly, our porgram has three major thrusts. First, we are validating the most mature technologies to provide intitial deployment options based on preferred defense architectures. Second, we are demonstrating the feasibility and readiness of technologies to support more advanced defense deployments to ensure the long-term viability of our defensive options. And third, we are conducting research that encourages innovation by the U.S. scientific community in response to the President's challenge to aid SDIO in identifying new approaches for eliminating the threat of ballistic missiles.

The most mature technologies are the ones that will determine the earliest date on which a deployment decision could be considered. Presently, technology concerning kinetic energy weapons for use in midcourse and terminal phases of flight fall into this "pacing" category, but as with any broadly based research effort other technologies could eventually achieve early success.

PROJECT/TASK ELEMENTS IN SDI

Question. Please identify each project/task shown in the SDI program elements as being mature technology, advanced technology or innovative technology (reference chart entitled "Meeting the SDI Goal"). Please provide a table showing costs according to these three categories.

Answer. The breakdown of dolalrs between mature technologies, advanced, and innovative and basic science was notational in the sense that the definitions were created by SDIO and do not represent an official DOD position. With the above caveat the approximate dollars are divided as follows:

	Fiscal year—	
	1985	1986
		$1.0B
Mature technology	$0.36B	.9
Advanced technology	1.00	1.7
Innovative science	.04	.1
Total	1.40B	3.78B

The intent of the slide was not to create new definitions of research effort, but to indicate in a very generic way that some effort was relatively close in terms of technical achievability. The funds in these categories are made up of individual programs whose majority of effort is in the designated category.

QUESTIONS SUBMITTED BY SENATOR PROXMIRE

HIGH FRONTIER CONCEPT

Question. Dr. Robert Cooper, the Director of DARPA, has testified that the high frontier concepts do not provide a cost effective potential for ballistic missile defense and could be countered at relatively low cost by the offense.

As you know, there are other experts within the defense community that have voiced the same criticism.

With so much doubt being raised about the high frontier concept, why are you asking for a 391% increase in this program for FY 86?

Answer. The SDI is asking for this increase in funding in order to provide the President and the Congress an assessment of the feasibility of strategic defense options by the early 1990s. In order to accomplish this goal, a great deal of research is being pursued across a broad spectrum of technical alternatives. This program needs the increased funding to support the research progressions in these proposed alternative solutions. Historically, our increase in funding is not unlike the increases requested in programs such as Apollo and Manhattan in their initial phases.

Question. The HEDI project has been reoriented so that non-nuclear interceptors would hit Soviet reentry vehicles high in the atmosphere instead of low. Is that correct? These interceptor would also be non-nuclear. Is that correct?

In other words the HEDI system, which is our demonstration project in terminal defense, has been reoriented away from traditional ABM defense of ICBMs and toward the astrodome defense?

If you were defending silos, the more effective way would be to intercept Soviet reentry vehicles at lower altitudes using nuclear kill vehicles. We could use smaller rockets for this task and our nuclear warheads would be more likely to destroy Soviet RVs. Correct?

Under HEDI, however, we are going to have to develop much larger rockets to reach higher altitudes in a short amount of time. Also using non-nuclear kill vehicles will place more stress on the system we deploy. Correct?

In other words, if you wanted to defend your ICBMs, HEDI would not be a particularly effective way to do it. Using nuclear kill vehicles will place more stress on the system we deploy. Correct?

The other kinetic energy weapons demonstration project you plan in ERIS, which would intercept Soviet RVs in midcourse. This interceptor testing will start in 1989 according to your milestone chart. Intercepting Soviet RVs in midcourse is a formidable task and we have already demonstrated that we have the technology to eventually accomplish this.

Don't you agree, however, that the even more formidable task is discriminating Soviet RVs from decoys?

Isn't that the major hurdle we face here? We can shoot at the RV. We've demonstrated that a bullet can hit a bullet. But the major technology hurdle, the one we're far from overcoming is finding the bullet to shoot at—discriminating between Soviet RVs and decoys?

If that is the case, it seems that we are jumping ahead of ourselves.

We are increasing funding for ERIS by 850% for FY 86. That's almost ten times higher than the increases you're asking for in any of the surveillance projects, which in this case are pursuing the much more important technology of discrimination.

Shouldn't we slow down the ERIS project until we get a better handle on the discrimination technology?

Answer. The KEW program is configured to provide a robust defense against reentry vehicles in boost mid-course and terminal phases. Within this program, HEDI will validate the technology for long range non-nuclear endoatmospheric interception using a kinetic kill vehicle. It is designed to operate primarily at altitudes from 40,000 feet to 150,000 feet in altitude. Using lateral thrusters designed into the warhead, HEDI engages reentry systems after the atmosphere has stripped most of the remaining penetration aids. HEDI will provide for, but is not restricted to, silo defense at the largest possible endoatmospheric ranges. One of the primary reasons for stressing the extended ranges is to allow time for shoot-look-shoot engagements not possible with lower altitude systems.

The use of nuclear weapons as part of an endoatmospheric reentry vehicle interceptors is certainly feasible. Guidance requirements and propulsion systems would be less demanding than those required by a non-nuclear interceptor. For example, propulsion systems anticipated for HEDI will produce a final velocity on the order of 19,000 ft/sec as compared to the SPRINT used in the Safeguard ABM system which had a final closing velocity of 10,000 ft/sec. The missile required to reach these speeds will be larger than a SPRINT type of vehicle.

Nuclear interceptors of this type unfortunately carries all the penalties of nuclear weapon explosions. Because of these penalties, it is not clear that smaller rockets equipped with nuclear warheads would be a more desirable system than HEDI. Also, such systems appear more prone to being overcome by multiple RVs targeted on single sites (since very low altitude engagements do not provide time for second shots).

ERIS is defined as a low cost, ground-based interceptor to attack reentry vehicles in the midcourse, exoatmospheric phase of the ICBM trajectory. The system operates at altitudes greater than 100,000 km and builds on the success on the Army's HOE experiment successfully conducted in June of 1984. Beyond the capability of HOE, ERIS must work toward size, weight, and cost reductions, cooperation with advanced pre-commit target acquisition sensors and incorporation of advanced capabilities (target selection, aim point selection, multi-color optical sensors, solid state inertial sensors).

Research in the ERIS program will step beyond the paper study concepts starting in FY 85 with strong emphasis on hardware bassboard demonstrations of the technologies critical to ERIS unique discrimination. ERIS can be viewed at the next step after HOE in validating the technologies necessary for mid-course RV intercept.

The hit-to-kill of a reentry vehicle demonstrated in the HOE experiment was only the first step in an exoatmospheric mid-course interceptor. ERIS proposes to intercept at much longer ranges than HOE, to operate in cooperation with other discrimination systems, and to incorporate on-board target homing using discrimination information provided from an external source. It also will operate in crossing engagements much more stressing than those of HOE, but still characteristic of anticipated operational scenarios.

It is indeed true that discrimination is a major hurdle to be overcome in the mid-course tier of SDI. The requirements of ERIS are also significant advances from the known exoatmospheric interceptor technology base. A viable mid-course interceptor depends not only on discrimination, but must have the ability to use that information to perform a kill.

IR SENSOR TECHNOLOGY PROJECT

Question. What is the difference between the IR Sensor Technology Project (0005) and the BSTS and SSTS projects (0006 and 0007)? It seems that the IR Sensor Technology Report Project is doing the same work of midcourse and post-boost tracking that the SSTS project does. Are we duplicating efforts here? Should these projects be combined in some way and their costs out back?

Answer. There are very basic differences between the IR Sensor Technology Project and the two experiment projects, SSTS and BSTS, which would make it impossible to efficiently combine the efforts. IR Sensors is a technology development effort which is examining generic technology areas which have application to a wide variety of possible SDI systems. The project is divided into three subelements: focal planes, optics and cryocoolers. The focal plane efforts are focused on developing very large infrared detector arrays that can be used in sensors. It is examining various technologies which will increase detector efficiency and allow the arrays to be produced faster and more economically. The optics portion of the project is examining techniques for housing the arrays which maximize their field of view, increases efficiency and provides protection from nuclear effects, particularly radiation. The technologies necessary to cool the focal planes to their operating temperature (typically below 40 degrees Kelvin) is being examining in the cryocoolers development. These coolers must be capable of operating, under load, for very long periods (years) without maintenance. All of this technology is generic in the sense that it applies to any IR system the SDI might develop.

The SSTS and BSTS are experiments designed to combine the various technologies and determine what potential exists for possible application to SDI systems. In general, the experiments take the technology developed in a project such as IR Sensors and combine it with other technologies to form an experimental "system" which can be used to test proposed SDI concepts. Combining the IR Sensors Technology Project with one of these experiments would actually increase SDIs overall costs since each experiment needing IR technology would then have to develop its own capabilities rather than drawing on a single, consolidated effort as now happens.

SENSORS RESEARCH

Question. You have mentioned in the past that the Surveillance Program will have a spillover benefit for our research into early warning systems. But doesn't the work in SATKA go way beyond the needs of our early warning system, for example in terms of resolution requirements? For example, isn't the BSTS project merely a souped-up version [deleted]. And wasn't this improved early warning system rejected in the past because it was in excess of the mission required for early warning?

Answer. Our research in Sensors does indeed have some very definite benefits for early warning systems, and you are right when you say that the SATKA effort goes beyond that needed for early warning. SATKA is developing the technologies for many functions in addition to the early warning mission. In fact, the requirement for early warning is a relatively minor part of their requirements. The sensor systems of an eventual SDI must accurately track, discriminate and hand over to the interceptor in addition to providing the early warning necessary to activate the defense. The resoluton, tracking accuracy, and computing capability for these missions far exceed those of early warning. The spill over exists, however, because we are doing research on generic technologies, such as Infrared Focal Planes and Data Processors, which has appliation to existing or future early warning systems. Even if the SDI is not deployed, these technological advances will improve the efficiency and effectiveness of future early warning systems.

The BSTS experiment is not just a "souped up" version [deleted] or any other existing system. It is an experiment to determine the capabilities of an optical sensor to acquire, track and provide accurate hand over to the kill mechanism. These missions require capabilities far in excess of the existing systems and are provided by new techologies and systems designs. Additionally, BSTS is truly an experiment and is not being designed for tactical deployment. If the decision were made to deploy an ADI defense, the Full Sale Engineering Development (FSED) would provide a tactical system for deployment.

Question. Gen. Abrahamson, you have noted in the past in justifying your budget increase that much of SDI consisted of ongoing programs. Isn't it true that many of these ongoing programs were drifting aimlessly in the past with no clear mission or justification? Doesn't SDI in reality have a lot of ongoing orphaned programs that couldn't find a funding home anywhere else, so they ended up with you? Aren't Talon Gold and Alpha examples of this?

Answer. Although many of the programs now being managed by the SDI had their origins in other organizations it is incorrect to characterize those programs as "drifting aimlessly." The SDI has consolidated these programs under a single manager in order to more logically examine the feasibility of the strategic defense options. Talon Gold and Alpha are two of the programs which were included in the spectrum of ongoing programs brought under SDI management.

Question. You can often determine the real priorities in a program by how its managers distribute the cuts that are mandated by Congress. I noticed of the $400 million in cuts Congress ordered in the SDI budget for FY 85, over half of them were made in SDI's six major demonstration projects. Am I correct in inferring from this that the six demonstration projects should have less a priority than the more important basic technology research?

Answer. The cuts which were made by the SDI in the program last year were a product of our analysis of how best to absorb the program reductions made by the budget process in Congress. The inference that the demonstrations have a lower priority than basis technology research is incorrect.

Question. General Abrahamson, the budget you are requesting for FY 1986—$3.7 billion—represents a 154% increase over FY 1985. I realize that research projects often show large increases from year to year, but in this case we're talking about a 154% increase for a major program. This is more than six times the percentage increase DOD is asking for its entire research budget. Wouldn't you agree that this is a staggering increase to request in a DOD program particularly when people on both sides of the aisle here are talking freezing the defense budget or allowing for only a small percentage increase?

Answer. It is well documented that a normal profile for a new R&D program includes significant funding increases during the early years. SDI is consistent with this profile. It is not normal that the total appropriation would reflect the cycle of an individual program. Therefore, not only do I feel that this increase is normal, but, if SDIO is to accomplish the President's objectives, it is critical that SDI be funded at the requested level.

Question. I'm not questioning so much the President's vision for star wars here. I think everyone would like to see the day that all nuclear weapons are rendered importent and obsolete. Many of us have questions over whether star wars would ever achieve that. But setting that argument aside for the moment—whether you agree with the President or not on the value of star wars, if you are going to have a star wars program, it should not be one that wastes a lot of money researching whether the President's dream is achievable. The concern many defense experts have who have been following star wars is that the 154% increase you're asking for will inevitably involve wasting a lot of money pursuing the President's dream. A number of experts like former Secretary of Defense Harold Brown have said a vigorous research program could be achieved at a much lower cost. James Schlesinger, another former DOD Secretary, said tha about a 30% increase in SDI over last year would be more than enough to achieve the President's research goal at this point. What is your response to Dr. Schlesinger's analysis?

Answer. A 30% increase in funding for FY 1986 would be insufficient to sustain the level of research initiated during FY 1985. It would require $2.5 Billion just to continue the FY 1985 program into FY 1986. President Reagan and Secretary Weinberger do not agree with Dr. Schlesinger's analysis. If they had they would have submitted a much lower request for SDIO.

SDI Deployment

Question. Could you give the committee an idea at the moment of how many orders of magnitude we are away in the technology and hardware that would be needed to deploy a militarily effective star wars system—one that would provide a so-called astrodome defense. Can you break this down as far as the key ingredients of a star wars system:

a. Surveillance, acquisition, tracking and kill assessment
b. Kill vehicles (kinetic or directed energy)
c. Battle management

Answer. It is our expectation that deployed defensive capabilities will be available in a series of stages. The initial defenses could be quite effective against the Soviet offensive nuclear missiles that are now deployed and against those that are just being deployed. These initial defenses would likely use a combination of sensors, weapons, and battle management equipment whose subsystem technologies are being developed now. It is not easy to compare these subsystems to those that have been used in past defense systems, since their technical approaches are so different. The sensors would utilize passive optical technology, rather than the currently available micro-wave radar technology. Their optical sensors are well enough understood that major experiments are now being initialed.

The weapons would primarily consist of kinetic energy devices, deployed either in space, or the surface of the earth, or in both places; they also are well enough understood to allow testing to begin. Some directed energy concepts might also be used in these initial defenses. For these early applications, both lasers (of several types) as well as neutral particle beams are candidates. The laser technology is 3-4 orders of magnitude away from initial requirements. Particle beams have a similar gap. In each case, major experiments are being planned to narrow this gap. For the most stringent requirement, perhaps 5-7 orders of magnitude increase in performance is required.

For the battle management subsystem, the technical issues are not easily represented in numerical terms. The most stressing issue is the configuration of the battle management subsystem in such a way that the software can be efficiently developed and the entire subsystems performance verified.

Question. Wouldn't you agree that at this point we are far, far off from having any rational idea of what kind of star wars system might work? Wouldn't you agree that at this point much more basic research needs to be done before we have any real notion of what a star wars system will look like? That will we should be doing now is exploring options?

Answer. A question as broad as this should be answered without careful qualification. The objective of the SDI program is to provide the technology necessary to defend ourselves, in the most expeditious manner. Whenever possible, technology needs will be minimized, thus circumventing the need for difficult-to-obtain capabilities which utilizing advances and break-throughs to the fullest.

Question. The reason I ask this, is that with the star wars technology being in such an infant stage at this point, it seems very premature for SDIO to begin demonstration projects within the next five years until we would have a better idea of what kind of star wars technology we will need. We're planning these demonstration projects in space-based chemical lasers and high-endoatmospheric interceptors before we have a clear idea of what kind of technology will be needed for boost-phase and terminal defenses. Isn't this like building a top-notch racing bicycle before you know whether you'll be in a bike race or automobile race?

Answer. We must have a balanced technology development program, consisting of subsystem technologies, suggested by ground and flight test experiments where appropriate. We *do* now have a fairly good idea of the levels of technology needed, based first on the DTST studies and supported and augmented by the System Architectural Studies are other systems analysis conducted or various technical components.

R&D IN PRE-SDI SYSTEMS

Question. Before the formation of SDI, the Department of Defense conducted R&D into what has been called conventional ballistic missile defense. This was been thought of as our best hedge if the Soviets break out of the ABM Treaty. Most experts have said that if the Soviets broke out of the ABM Treaty this conventional BMD research would enable us to deloy a system to protect our ICBMs within 5 years. But the experts, and they include people within the Army BMD program say that research into conventional BMD has been downgraded under SDI see we can pursue research into an astrodome defense. Is this true?

Answer. The SDI program centers major technology developments and experiments that fall into the categories described as "Conventional BMD." These programs are well supported and would be available as a source as a source of technologies that could be used to respond to a Soviet BMD breakout. The required characteristics of such a defense have not been defined at this time, but work is underway to do so. We are now supporting conventional BMD technology at a funding level higher than what existed prior to SDI.

As the program progresses, we will be able to accumulate the best existing technology and initiated full scale development of a defense responsive to USSR breakout. This process will yield a useful defense capability in the mid-90s under present plans. If the breakout were to occur earlier, we should be able to redirect this effort somewhat if accelerated program procedures were adopted. Again, it should be noted that more conventional BMD technology has not been de-emphasized.

Question. How far off would we now be in responding to a Soviet ABM breakout under SDI as it is presently structured? Would it be more than 5 years as a result of the de-emphasis in conventional ABM research?

Answer. We believe that a response could be structured [deleted].

Question. Wouldn't you agree that the ultimate question is not whether we can deploy an SDI system, but rather whether we can deploy an SDI system that stands up on the face of Soviet countermeasures and still destroy Soviet offensive nuclear weapons? Wouldn't you agree that the countermeasures the Soviets might deploy represent a major hurdle for any SDI system? That was the conclusion of the Fletcher Panel.

Answer. An SDI system initially deployed would be effective against Soviet countermeasures. To be effective against possible countermeasures in the far-term the U.S. would need technological advances.

Question. I noticed in the organizational chart for SDI, that under the Systems Program there is a task title "Threat Definition." Is this the task that is concerned with evaluation the Soviet threat and countermeasures and SDI system would face?

Answer. The threat definition task is under the Systems Directorate and is concerned with the Soviet threat and technical vulnerability of Soviet weapon systems.

Question. In other words, is this where you have the Red Team?

Answer. The Red team effort is part of the threat definition line.

Question. (if that is the case.) According to the figures I've seen, about $9 million has been allocated to this Threat Definition task. If that's the case, it means that about two-tenths of one percent of the proposed SDI budget for FY 86 would go to assessing the Soviet threat SDI might face. Isn't this an unusually low amount for such an important question which SDI will deal with?

Answer. The threat definition line is $11M for FY 86. Much of the threat analysis is accomplished by national intelligence agencies and only specific SDI oriented threat and red team efforts are budgeted for in this line.

Question. Under the systems program, you have set up this horse race procedure where 10 contractors do individual architecture studies of what the entire star wars system will look like. And in 12 months they will be coming up with pilot architectures. How can we spend money setting up a system architecture at this point when we have no idea what kind of technologies will be useful at this point in any star wars system? Aren't we jumping the gun with these systems studies with the basic technology being in such an infant stage? Isn't it like drawing up a gameplan for a football game before you have any idea who your players are? Will the system architecture you develop in a year lock the star wars program into the technologies the architecture calls for development?

Answer. One of the primary tasks of the system architecture study is to project what technology will be available in future years for SDI system if it's deployed. Comparing technology needs derived from the definition of various architectures with technology projections, we can prioritize the SDI program to give emphasis to those technologies which our system studies indicate have the highest payoff. In essence this important part of the architecture studies allows us to draw up our "draft plan" which picks future technologies to augment our work in current BMD technologies. This is a continuously evolving process as we evaluate and reevaluate various architectures.

AIRBORNE OPTICAL SURVEILLANCE PROJECT

Question. The Airborne Optical Surveillance Project is one of the demonstration projects. What was the mission of AOS before SDI? To track low flying planes? ASAT tracking?

Now AOS is operating as more or less a BMD AWACs to track re-entry vehicles in the mid-course and terminal phase?

Isn't a demonstration project in AOS a bit premature at this point? Isn't this an example of conducting a demonstration and pumping hundreds of millions of dollars into a project whose end resuslt could well be ineffective in a star wars system?

Doesn't AOS have many of the same drawbacks AWACs do? Which is keeping the planes in the air? Can't they stay in the air about 5 hours at a time? That may be a short time in a strategic battle environment that may last weeks. Wouldn't we be forever shuttling these planes up in the air to perform their missions nationwide?

Answer. First, we need to clarify our terminology. The Airborne Optical surveillance Project contains two sub-elements or tasks: The Airborne Optical Adjunct (AOA), which is the current experiment, and the Airborne Optical Sensor (AOS), which is a concept for a follow-on sensor and platform which might someday have application as part of an SDI-like defense. Although the AOA concept predates the SDI, neither of these tasks has had a mission other than what is currently proposed. In general, the AOA will provide early detection, discrimination and handover to a fixed ground-based radar in order to reduce the reaction time of the terminal defenses and allow intercept of the reentry vehicle to occur at higher altitudes (necessary to minimizing damage from salvage fusing.) In particular, it should be noted that AOA is an experiment designed to answer specific questions about technical capabilities of airborne sensors. The experiment will provide detailed data on IR sensor performance, on-board data processing, and the unique aero-optical phenomena which can only be obtained in this manner. Results of this experiment will feed back into the AOS efforts and help determine what, if any, role such an AOS might play in an SDI of the future. As with any experiment, there is a degree of risk associated with AOA. There is always the possibility that some unforeseen physical phenomena may render the entire concept impractical or ineffective. It is precisely for this reason that it is necessary to conduct such experiments early in the program so that there is time to pursue other avenues or further develop the technology.

The AOS, which might represent a technology which could someday be deployed, is expected to be much different than the AOA. SDI is not developing an AOS. The current efforts are limited to concept definition and research in technologies which might have application to such a system. AOS will have potential drawbacks, including some of those mentioned; but it also has inherent advantages. Proper design of an airframe, without stressing the state of the art, should allow the aircraft or remotely piloted vehicle to stay on station many times the five hours proposed. The inherent mobility and capability to shuttle between bases combined with its presence over our own territory increases it's survivability compared to other proposed systems which must operate over Soviet territory or are fixed at a ground location.

TERMINAL IMAGING RADAR DEMONSTRATION PROJECT

Question. Under the Terminal Imaging Radar Demonstration Project (0009), the descriptive summaries say that all work on [deleted]. Isn't launching a demonstration project like TIR highly premature at this point? We have no idea what the terminal defense will look like at this point. Whether it will, in fact, be a highendoatmospheric defense or end up as a terminal defense engaging in the lower parts of the atmosphere. Shouldn't we be pacing this project more until we get a better idea of technologies needed in the midcourse and boost phase?

Answer. You are absolutely correct when you say that we don't know what the terminal defense would look like at this time. It is likely to be some years before we have all the data necessary to make proper recommendations on such a design. This is precisely why the TIR experiment is necessary and why it must be completed as soon as possible. The TIR project is an experiment designed to learn about the capabilities of a ground-based radar to discriminate at high altitudes based on imaging data. The high altitude requirements exist so that intercepts can occur earlier, preventing damage to softer targets than had been protected under earlier BMD concepts. To do so requires significant advances in radar technology and design which are an evolution of earlier BMD work not an abandonment of these efforts. Until the results of this and other experiments are avaialble, systems design can only be considered in problematic terms. Once data of this nature is available from our major experiments it will be possible to consider defense design in terms of what may actually be possible, not just what one thinks is a good idea.

Question. It's questionable whether nuclear pumped lasers could be used in boost-phase or midcourse defense because of the [deleted].

Answer. It would be premature to make such conclusions. Speculation exists regarding the use of nuclear driven directed energy devices for many missions. At the present time, research efforts under the SDIO program are attempting to analyze and assess this technology and its potential applications. It is clear that an understanding of this technology and its uses is essential if a potential strategic defensive system is to be effective, affordable, and survivable.

Question. Nuclear directed energy weapons [deleted] would require [deleted] nuclear devices in space to pump the lasers. [Deleted].

Answer. The U.S. has no plans to orbit nuclear weapons, but we must understand the strategic implication of such an action by the U.S. or the USSR. There is considerable value in pursuing nuclear driven directed energy device research and experimentation. It will give us a necessary understanding of the technology so that we may preclude its use as an effective countermearsure. If research indicates nuclear driven directed energy devices are a viable option, the attributes of such a device or system will be considered prior to any decisions made to pursue their development.

ALPHA PROJECT

Question. One of the major demonstration Projects SDI plans is the ALPHA project, which will be a [deleted] infrared chemical laser. Isn't it true that we would need to put up a [deleted] laser or more for it to ever be militarily effective? Isn't it true that we're about 10 orders of magnitude or more away from having the lethality necessary for militarily useful thermal lasers?

So this big demonstration project we are planning with ALPHA won't be militarily useful as it is now configured [deleted].

My question is why pour hundreds of millions of dollars into a project to demonstrate a chemical laser system that is [deleted] under what would be requried for a space-based system?

The space-based laser project seems to be an example of where we are barreling into a project simply because it is our more mature technology and not because it is necessarily the right type of system for star wars.

Answer. ALPHA is a very important step in developing the feasibility of and design practices for potential space-based laser weapons concepts. [Deleted]. Such a system, based on Alpha technology, may well be the "right type of system" for a strategic defense.

Opinion in the scientific community is divided, with competent people on both sides. Only by performing the experiment and obtaining the hard data can this issue be properly settled.

SPACE-BASED CHEMICAL LASERS

Question. Dr. Edward Teller has testified before the Senate Armed Services Committee that space-based chemical lasers are not the way to go in a star wars system. Teller said, "infrared lasers, the presently known chemical lasers, do not seem to me to fulfill the basic requirement of a good defense." Would you comment on Dr. Teller's criticism of space-based chemical lasers.

The reason Dr. Teller criticized space-based IR lasers was that they are, (a) to (sic) vulnerable, (b) too expensive to get up into space, and (c) too much of the weapons system has to be put at risk in space. Other scientists have criticized IR lasers because their wavelengths are too long, which affects the range of the weapon and the dwell times are too long, which limits how many times the weapon can be used. These scientists say we should be looking more toward ground-based lasers or at least space-based lasers with shorter wavelengths.

Why should we waste hundreds of millions of dollars on a laser system, when there's so much doubt at this point as to its ultimate effectiveness?

Answer. There are similar speculations and voiced doubts concerning most of the concepts being researched in the SDI technical program. The program is being pursued to give us the technical knowledge necessary to confidently make decisions to pursue development of particular concepts. Included in the research program is investigation of how to make a strategic defense survivable, effective, and affordable. All concepts which show promise need to be experimentally developed to the point where sufficient experimental data is available for making a confident decision.

In the specific case of space-based lasers, there are other equally competent scientists that argue the opposite point of view with similar convictions—i.e. deployed space-based weapons have substantial advantages in survivability; they are no more or less expensive to get into space than other boost phase weapon concepts; the wavelength is adequate for maintaining the spot sizes required for the lethality required at the ranges of interest; etc.

VULNERABILITY OF AOS

Question. Isn't AOS's biggest problem vulnerability? In a nuclear environment, where salvaged fuses warheads are going off above us everywhere, wouldn't this be absolutely debilitating to an Airborne Optical System? Wouldn't it be completely blinded? In fact, isn't this how we would blind the Soviet Galosh system around Moscow?

Instead of plunging ahead with AOS, which may not work, shouldn't we be concentrating on competing technologies, such as forard acquisition sensors. Wouldn't pop-up satellites that took a look around be less vulnerable, more survivable, and have a longer flight time?

When will AOS run us into compliance problems with the ABM Treaty?

Answer. First, we need to clarify your terminology. The Airborne Optical Surveillance Project contains two sub-elements or tasks: The Airborne Optical Adjunct (AOA), which is the current experiment, and the Airborne Optical Sensor (AOS), which is a concept for a follow on sensor and platform which might someday have application as part of an SDI-like defense. The AOS is currently a fairly low level effort limited to concept definition studies and some long lead time technology efforts which may have application to other systems as well. AOA is an experiment designed to answer specific questions about technical capabilities of airborne sensors. The experiment will provide detailed data on IR sensor performance, on-board data processing, and the unique aero-optical phenomena which can only be obtained in ths manner. Results of this experiment will feed back into the AOS efforts and help determine what, if any, role such an AOS might play in an SDI of the future. As with any experiment, there is a degree of risk associated with AOA. There is always the possibility that some unforeseen physical phenomena may render the entire concept impractical or ineffective. It is precisely for this reason that it is necessary to conduct such experiments early in the program so that there is time to pursue other avenues or further develop the technology.

If eventually deployed, AOS will have vulnerabilities as does any system. We expect that these can be significantly reduced by application of technologies being developed in the SDI. Nuclear effects are always a concern, and a major fraction of our program is directed to addressing this issue. If these technologies prove successful many of the blinding effects may be overcome. It should be noted that the same phenomena which may hamper the ability of an AOS to perform its mission apply to all optical systems, including pop-up systems. We are examining pop-up systems and have an experiment scheduled in that area as well. A greater emphasis is being placed on the airborne sensor because of the difficulties associated with forward basing pop-up systems (vulnerability before launch) and the rather long time required to get them into orbit. However, no decisions are being made to eliminate possible components of the SDI until the data is available to make an accurate analysis.

The current AOS effort, which is limited to concept definition and general technology development, has been reviewed and determined not to violate any aspect of the ABM Treaty. If a future decision requires us to go beyond this stage, additional review will be necessary to determine compliance status.

RECESS TO CODE WORD SESSION

Senator **Stevens**. Could we have the code word level session, please.

[Whereupon, at 12:15 p.m., Tuesday, April 2, the subcommittee proceeded in a code word session.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

TUESDAY, APRIL 23, 1985

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 10:05 a.m., in room SD-192, Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, McClure, Andrews, D'Amato, Rudman, Proxmire, Hollings, and Sasser.

DEPARTMENT OF DEFENSE

Under Secretary of Defense for Policy

STATEMENT OF THE HONORABLE FRED C. IKLE, UNDER SECRETARY OF DEFENSE FOR POLICY

STRATEGIC DEFENSE INITIATIVE

BUDGET REQUEST

Senator **STEVENS**. I will call the hearing to order.

We are here today to review the fiscal year 1986 budget request for the strategic defense initiative. The administration's request for SDI—$3.7 billion—is $2.3 billion more than the fiscal year 1985 appropriation of $1.4 billion. The Senate Armed Services Committee has already proposed a $300 million reduction to SDI, an 8.8-percent reduction to the program.

This is the third and last in a series of hearings the subcommittee will hold on the strategic defense initiative. Our first hearing covered the specific programs encompassing SDI. Yesterday, we heard from outside witnesses, some of whom were skeptical of the administration's strategic defense program—if not the concept of strategic defense itself.

I am indebted to my good friend from New Hampshire for chairing that hearing. I was not able to be here because of the conference on Nicaragua.

Today we will hear from the Under Secretary of Defense for Policy, Dr. Fred C. Ikle, and the Director of the Strategic Defense Initiative Organization, Lieutenant General James Abrahamson.

POLICY IMPLICATIONS OF SDI

At today's hearing we intend to discuss the policy implications of SDI, its relationship to arms control and deterrence, its general economic and industrial impact on the Nation and the ability of the SDI office to financially execute the program.

SDI PORTION OF FISCAL 1986 BUDGET

SDI now comprises 4.4 percent of the fiscal year 1985 DOD research and development budget. The proposed fiscal year 1986 budget would increase that to 9.4 percent. The $3.7 billion budget request for SDI is 1.2 percent of the DOD budget for fiscal year 1986, and about one-third of 1 percent (.35 percent) of the total Federal budget for fiscal year 1986.

I believe it to be one of the most important items in the Department of Defense request this year. I might say although this is the last indicated hearing, if further hearings are necessary, we will be certainly pleased to have them.

Let me say parenthetically, gentlemen, I am the author of that Nicaragua resolution that is on the floor. As we all know, it is in the process of being amended. If it is amended, it is no longer within the jurisdiction of this committee. It would then be within the jurisdiction of the Foreign Affairs Committee.

I may be called over there if it is not amended. We believe it will be amended very quickly. We will have to wait and see.

Do you have an opening statement, Senator Proxmire?

Senator **Proxmire**. No.

Senator **D'Amato**. I have an opening statement, but in the interest of time, I would like to submit it for the record.

Senator **Stevens**. Thank you very much. It may appear in the record.

Prepared Statement of Hon. Alfonse D'Amato, U.S. Senator From New York

Mr. Chairman, the President and other members of this administration have stated on numerous occasions that the Strategic Defense Initiative [SDI] Research Program will be conducted in a manner fully consistent with all U.S. treaty obligations, including the 1972 antiballistic missile treaty. In his forward to the President's Strategic Defense Initiative, President Reagan has stated, "the strategic defense initiative [SDI] is a program of vigorous research focused on defensive technologies with the aim of finding ways to improve a better basis for deterring aggression, strengthening stability, and increasing the security of the United States and our allies."

It is my sincere hope that research under the SDI program will achieve these goals. We are bound, therefore, to insure that this program is adequately funded. Critics charge that the $2.3 billion funding increase to $3.7 billion in fiscal year 1986 for this program is excessive. But that boils down to the question we face here today: should we continue research under the SDI Program or should we kill it? If the President is correct, and I believe he is, then we must realize the full potential the strategic defense initiative.

The Soviet Union's research and development defensive systems first became public when George Keegan, in March 1977, published his article in Aviation and Space Technology. At that time, it became evident that Soviet programs for the development and application of technologies to strategic defense were in full swing.

According to the 1985 edition of Soviet Military Power, the Soviet Union's High-Energy Lasar Program, which dates from the 1960's, is much larger than the U.S. effort. They have built over a half-dozen R&D facilities and test ranges, with over 10,000 scientists and engineers associated with lasar development. Recently, the Soviets have progressed beyond technology research, in some cases to the development of prototype laser weapons. Since the early 1970's, they have had a research program to explore the feasibility of a particle beam weapon in space.

The Soviet Union also maintains active programs on more conventional approaches to their defensive strategy, including upgrading the antiballistic missile system in place around Moscow and research and development on a new rapidly deployable antiballistic missile system.

Soviet programs for the development and application of directed-energy technologies to strategic defense have been vigorous in the past. They will continue to be so in the future, no matter what the United States does about new strategic defense initiatives. Killing this program will not stop them. We must continue SDI development.

On offensive weapons, the Soviet Union's relentless improvement of its ballistic missile forces has eroded the survivability of our land-based forces. On defensive weapons, the Soviet Union has continued to pursue strategic advantage through the development of defenses with increased capability to counter surviving U.S. retaliatory forces.

The United States Congress has made it clear that the United States is not willing to match the Soviet Union's offensive strategic force build-up. Therefore, if we abandon efforts to research and develop defensive systems of our own, we will start on the long slide toward being a second world power.

The SDI Research Program is a necessary element of our efforts to maintain the stability in the nuclear balance.

It will provide a future President and a future Congress the ability to deploy advanced defensive systems, if such a course of action is deemed reasonable at that time.

Thank you, Mr. Chairman.

IMPORTANCE OF SDI

Senator **Stevens**. I will ask you gentlemen which one should go first.

Dr. Ikle, the General indicates you are first.

Dr. **Ikle**. Mr. Chairman, thank you for inviting us to testify before your committee. I will be very brief and just make a few selected points from the statement I will submit for the record.

You are right, Mr. Chairman, that this 1⅕ percent of the defense budget is of extraordinary importance. Its long-term importance for the future security of our country and our alliances is far greater than the relatively small percentage might suggest.

As you know, the technology on strategic missile defense is to be funded at $3.7 billion in the President's proposed budget for 1986 and for 1987 the proposed budget amounts to $4.9 billion.

The Strategic Defense Initiative holds great promise for a safer nuclear relationship between the United States and the Soviet Union and for a more solid foundation on arms control. It is the key for overcoming this relentless competition in offensive arms and it can open the door at last now to nuclear strategy that is consistent with the moral and political values of our democracy; that is to say, to seek to defend, not to prepare for revenge.

Hence, the Strategic Defense Initiative is not some optional experiment to be continued or curtailed depending on short-term budgetary and arms control considerations. It is a long-term effort to strengthen our ability to prevent nuclear war.

vent nuclear war.

If you wish, Mr. Chairman, I can address the various objections that tend to be raised against the Strategic Defense Initiative. In my prepared testimony I cover a number of these points one by one and maybe in reply to your questions or those of other members of this committee, I could take those up. To save time now, I shall leave that for the submitted statement in the record.

U.S. APPROACH TO ALLIES ON SDI

Let me just touch briefly on one question that has been in the news a little bit recently, our approach to our allies for their possible participation in the initiative.

Since President Reagan introduced SDI, many of our allies have inquired about the prospects for their participation. Because of this interest and because the SDI Program is important to the future security not only of the United States but of our allies as well, Secretary Weinberger recently issued a formal invitation to our allies to participate.

In our ongoing discussions with allied governments, we tried to pave the way for their bidding by firms in allied countries on Defense Department requests for proposals. We believe that this will enhance the prospect of managing the evolution of a defense-oriented strategy within the alliance.

A proposal to curtail the research at this time I think would endanger our ability to address the change in strategy in a timely fashion and would continue to let the Soviet Union lead on this front. We should, therefore, maintain our project, on which General Abrahamson will testify from his point of view, at the present level as recommended by the President.

ROLE OF ABM TREATY IN SDI

As you know, discussion has occurred in relation to the role of the ABM Treaty in the strategic defense initiative. The United States, of course, will not violate that treaty. We have a special program carefully worked out to stay in compliance with the treaty.

We must recognize, however, that the Soviet Union not only violated the spirit of that treaty, but its formal provisions. As the President has informed the Congress, the new Soviet radar in Siberia constitutes a clear violation.

Of course, the expectations of the treaty that it would lead to a halt in the competition in offensive weapons have not been fulfilled at all. It did not slow down the buildup in Soviet offenses in nuclear arms nor did it deter Soviet efforts in strategic defense. Thus, in that sense the treaty failed to bring the promised stability.

SOVIET VIOLATION OF TREATY

I said, of course, that the United States will not violate the treaty. We must, however, address the problem of Soviet noncompliance and this will be a continuing issue on which we need to focus, both the Congress and the executive branch.

Mr. Chairman, it is time we learned the lessons of the past. What we thought would be a stable relationship on a consensus of mutual vulnerability some 15 or 20 years ago turned out not to be stable. The idea suffers from an inherent contradiction.

To rely on a managed consensus not to defend ourselves with a partner, the Soviet Union, which increases incessantly its capability to destroy the United States is not plausible, indeed, it is not a desirable basis for a stable strategic relationship in the long-term future.

I believe, Mr. Chairman, it is far more likely that over a period of years we can agree with the Soviet Union to reduce offensive forces while allowing each other to have effective defenses. Such a relationship would meet the priority objective of any rationale government, that is, to protect its homeland.

Thank you, Mr. Chairman.

[The statement of Dr. Ikle follows:]

PREPARED STATEMENT OF HON. FRED C. IKLE

UNDER SECRETARY OF DEFENSE FOR POLICY

Mr. Chairman,

The program that is to be addressed in this hearing calls for about one and one-fifth percent of the defense budget. But its long-term importance for the future security of our country and our alliances is far greater than this relatively small percentage might suggest.

The research and technology effort on strategic missile defense is to be funded at $3,722.2 million in the President's proposed budget for FY 1986. For FY 1987, the program's proposed budget amounts to $4,908.2 million.

The Strategic Defense Initiative holds great promise for a safer nuclear relationship between the United States and the Soviet Union and for a more solid foundation for arms control. It is the key for overcoming the relentless competition in offensive arms. It can open the door at last to a nuclear strategy that is consistent with the moral and political values of our democracy--to seek to defend, not to prepare for revenge.

The Strategic Defense Initiative is not some optional experiment, to be continued or curtailed depending on short term budgetary or arms control considerations. It is a vital long-term effort to strengthen our ability to prevent nuclear war. By denying nuclear missile forces their military mission, strategic defense systems can enhance deterrence and stability as well as facilitate significant reductions in offensive nuclear arms.

It might be helpful to address a few of the objections that tend to be raised against strategic defense.

Some objections can be dispensed with rather quicky, or have already been answered to everyone's satisfaction. For example, objecting to missile defenses because they would "militarize" outer space makes as much sense as objecting to anti-tank weapons for NATO because they would militarize Central Europe. The militarization of outer space began in the late 1950's, when the first ballistic missiles were tested.

Other objections to strategic defense can be grouped by three broad themes: (1) that the defenses would create new instabilities; (2) that they would not work, or not work well enough; and (3) that they would hurt the prospects for arms control. Let me make a few, brief points about each of these.

It has been said that even if a fully deployed and effective strategic defense might be a good thing, the transition to it would be destablizing. This is not the case. On the contrary, the initial phases of a missile defense, on the road to a more complete deployment, would enhance the survivability of our present deterrent forces. As a growing fraction of the Soviet missiles could no longer reach their targets, Soviet planners would face increasing uncertainties and difficulties in designing what they otherwise might consider to be a rational first strike.

Another argument about the allegedly destabilizing effect of missile defenses is equally flawed. It has been noted that certain elements of a defensive system--especially the boost phase intercept--would have to be employed very quickly in the event an enemy attack started. So some have argued that a decision "to start nuclear war" would thus have to be delegated to computers. But by engaging these defensive systems, the United States would not cause destruction anywhere, we would not hit targets on the ground anywhere, no one would be killed. Contrast this with a future without strategic defenses, in which our retaliatory offensive forces and our command and control could become increasingly vulnerable to a massive surprise attack, hence demanding increasing reliance on quick, human decisions, probably based upon data collated and analyzed by computers.

A second set of objections to the Strategic Defense Initiative has to do with the imperfection of defenses: ballistic missile defenses could not stop cruise missiles or aircraft; in a massive attack, a few missiles could always get through; and even air and missile defenses could be circumvented by smuggling nuclear bombs into cities in other ways.

It is, of course, true that if we want to defend against aircraft and cruise missiles, we have to add air defenses. In fact, these might utilize some of the same technologies and same systems. Yet, effective ballistic missile defenses, even without air defenses, would be of enormous value, since a confrontation of ballistic missiles is far more destabilizing than the threat of aircraft and cruise missiles.

As to the "leakage" of a few missiles, or the smuggled nuclear bomb, we have to ask ourselves what would be the purpose of such an attack? It would cause grievous destruction, but it would not destroy our military capability. It would be an irrational attack, an act of terrorism on an unprecedented scale. To be sure, we do need to worry about nuclear terrorism and irrational or accidental attacks in the next century. In fact, this is a further reason for developing strategic defenses. Defense can offer protection against certain irrational acts, whereas a continued, exclusive reliance on a threat of retaliation would offer no protection against this danger.

Some critics of the Strategic Defense Initiative have argued that its purposes are unclear: is it to defend our cities or to protect our deterrent forces? As we explain that by destroying attacking missiles we would help defend cities, we are blamed for undermining mutual deterrence. As we explain that by destroying attacking missiles we would also protect our deterrent--hence depriving an attack of its military objective--we are blamed for abandoning the goal of protecting cities. The more effective the defenses, the less an attack would accomplish in terms of military objectives, hence the more irrational such an attack would be if carried out. And the more effective the defenses, the less the destruction caused by any attack, whether accidental, irrational, or deliberate.

I want to touch briefly on our approach to allies for their possible participation in strategic defense. Since President Reagan introduced the Strategic Defense Initiative, many of our allies have inquired about the prospects of their participation. Because of this interest, and because the SDI program is important to the future security not only of the United States but of our allies as well, Secretary Weinberger recently issued a formal invitation to our allies to participate.

Allied countries wishing to participate will identify those areas of research excellence where they believe they could make a contribution. We are holding bilateral discussions focusing on how each ally's expertise could be used most effectively. These discussions would pave the way for bidding by firms in Allied countries on Defense Department requests for proposals.

We believe that allied participation not only will enhance the prospects for the program's success, but also will prove to be beneficial in other respects as well. Since we want to extend the benefits of strategic defense to our allies, early involvement by the laboratories and industries of allied countries will facilitate the understanding of allied governments and their ability to join us in the future.

Three weeks ago, Senator Proxmire together with Senator Mathias, Bumpers and Chafee, introduced S.879 as the "Alternate Strategic Defense Initiative Authorization Act." I was pleased to see that when he introduced the alternate, Senator Proxmire supported the basic goals of the President's Strategic Defense Initiative. However, the alternate would go against these goals. This act would cut the authorization that the President requested in half. In addition, it would specify in great detail the allocation of the remaining half. General Abrahamson will address the problems that would be created by this reduction and detailed reallocation.

I will confine myself to a couple of broader observations about the policy implications of this alternate SDI authorization act.

If we slow down the Strategic Defense Initiative in this early phase, we would not have the answers in the next decade that we need to chart our long-term strategy and arms control policy. We would continue to let the Soviet Union expand its lead in ballistic missile defenses. More importantly, we would weaken the Soviet incentive to join us in designing a better, safer strategic relationship that can facilitate sharp reductions in offensive arms.

Mr. Chairman, it is time we recognize that our arms control theories of fifteen years ago were mistaken. We did not slow down the build-up in offensive nuclear arms by curbing strategic defense. The ABM Treaty failed in bringing stability. In the 15 years since the negotiations on the ABM Treaty, the Soviets have added some 7,900 medium and long-range nuclear missile warheads to their arsenal--an increase of 515 percent. Since the ABM Treaty was signed, some 3,850 Soviet missile warheads were added, a growth of almost 65 percent. Clearly, the Soviet Union did not agree with us on our philosophy for the ABM Treaty.

Moreover, the Soviet Union not only violated the spirit of that treaty, but its formal provisions. As the President had to inform Congress, the new Soviet radar in Siberia constitutes a clear violation.

It is somewhat curious, therefore, that this proposed alternate SDI authorizaton (S.879) would not only cut our research in half, but conclude this mutilation of the President's Strategic Defense Initiative with a reaffirmation of the commitment of the United States Congress to the 1972 ABM Treaty, urging the Department of Defense to exercise "special care" to ensure that the programs are fully complying with the treaty. The treaty is dealt with as if it were a unilateral covenant affecting only the United States. Not a word is said about compliance by the other signatory.

The SDI Research Program is being conducted in a manner fully consistent with all US Treaty obligations. Compliance must be based on objective assessments of capabilities which support a single standard for both sides, not on subjective judgments as to intent which could lead to a double standard of compliance. The Soviets already are conducting activities of the type which some would like to prevent the United States from doing. For example, the new SA-X-12 surface-to-air missile, which incorporates ballistic missile defense capabilities, is nearing operational status. The SA-X-12 is both a tactical surface-to-air missile and anti-tactical ballistic missile. It may have the capability to engage the Pershing I and Pershing II ballistic missiles. The SA-X-12 may also have the potential to intercept some types of US strategic ballistic missiles as well.

Of course, the United States will not violate the treaty, and the SDI programs have been designed to comply with it. But we will further erode the value of arms control agreements if we fail to react to continued non-compliance by the Soviet Union.

Mr. Chairman, it is time we learned the lessons of the past. A relationship of consensual vulnerability cannot be stable. It suffers from an inherent contradiction. Relying on an imagined consensus with a partner not to defend oneself while renewing incessantly one's capabilities to destroy that partner, is not a plausible, not a desirable basis for a stable strategic relationship. It is far more likely that we and the Soviets could agree to reduce offensive forces while allowing each other to have effective defenses. Such a relationship would meet the priority objective of any rational government--to protect its homeland.

BLANK PAGE

U.S. Air Force

Strategic Defense Initiative Organization

STATEMENT OF LT. GEN. JAMES A. ABRAHAMSON, U.S. AIR FORCE, DIRECTOR, STRATEGIC DEFENSE INITIATIVE ORGANIZATION

RESEARCH PROGRAM OF SDI

Senator **Stevens**. General Abrahamson.

General **Abrahamson**. Thank you, Mr. Chairman.

I am pleased with the opportunity to again appear before your committee.

If I may, I would like to highlight a few points with respect to the strategic defense initiative, or SDI, to build on our session of April 2.

Since the President's speech in 1983, we have seen many interpretations of what his vision entailed and what the SDI was expected to accomplish. In spite of what would appear to be many conflicting reports, I would like to emphasize that our goal has not changed and has, in fact, remained consistent with the direction outlined by the President.

The driving force behind his concept is freeing the world from the fear of nuclear conflict. Our ultimate goal is the elimination of all nuclear missiles. To move toward this objection, then, the SDI has been structured as a program of vigorous research focused on advanced defensive technologies with the aim of finding ways to provide a better basis for deterring aggression, strengthening stability, and increasing the security of the United States and our allies.

I would again stress that the SDI is a research program geared to provide a future President and Congress the technical knowledge required to support a decision on whether to develop and later deploy advanced defensive systems. Such a development would enhance and strengthen deterrence while also providing critical leverage for truly meaningful reductions in nuclear weapons.

Now, as a research program, the SDI is not a weapons development program, nor is it a program with preconceived notions of what a potential defensive system against ballistic missiles should entail. Emphasis in the program is being given to nonnuclear weapons for defense.

The defense that might evolve from the SDI will not be intended to defend only our strategic weapons systems nor is it a program that we feel should lead to an arms competition in space. We are considering ways to defend both ourselves and our allies against the ballistic missile threat.

As the work moves ahead, we are in full consultation with our allies. It is a research program designed to answer numbers of scientific and engineering questions that must be addressed before the promise of new technologies can be fully assessed.

SDI RESEARCH IN COMPLIANCE WITH ABM TREATY

As Dr. Ikle pointed out, that research will be carried out in strict compliance with our obligations within the ABM Treaty. An appreciation of these tenets is essential to an understanding of the SDI, and obviously our policy and strategy base that goes with that.

Even those who may be termed by some as critics of the program accept this view. They would feel that the SDI should be an initiative that supports prudent and high quality research into ballistic missile defense that can provide options to future Presidents and future Congresses.

Since assuming the position of director of the program last year, we have made every effort to convey such an understanding of the program. The importance of the SDI and the implications for future peace and stability cannot be overstated.

EFFECT OF BUDGET REDUCTIONS ON SDI PROGRAM

Nonetheless, our budget sustained a 21-percent reduction in its first year. There is clearly damage done by these fiscal year 1985 cuts. We tried to minimize that damage by managing the reductions in accordance with the following:

For new starts, we delayed the initial implementation.

For existing programs we either delayed program enhancements designed to tailor the program more closely to SDI needs, or we stretched out or temporarily interrupted the progress of such programs where it was possible to do so without disrupting the integrity and continuity of the program.

In one particular case—the demonstration of advanced acquisition, pointing, and tracking, known as Talon Gold—we severely limited the scope of the existing program so that we could provide a major restructuring of our efforts.

For some programs we continued to fund at the rate indicated in our fiscal year 1985 budget request, because they are fundamentally important to decisions which must be made in the early stages of the SDI program.

While we were generally successful in meeting our overall strategy, achieving the plannd funding levels in fiscal year 1986 has become much more important if we are to continue the goals, time lines, and tasks of the SDI.

In spite of the reductions, we have continued to move ahead as rapidly as possible with the program and I commented on that in our closed session. In the short time since its inception, the SDI has made remarkable progress. The commitment and dedication of those involved with every element of the program is evident.

FISCAL 1985-89 BUDGET RECOMMENDATIONS

In continuing to build on this solid foundation and very encouraging beginning, we estimate that the SDI will cost about $26 billion between fiscal years 1985 and 1989. Elements are again summarized as follows:

[In millions of dollars]

	Fiscal year 1985 appropriation	Fiscal year 1986 request
SDIO program:		
Sensors	$546	$1.386
Directed energy	376	966
Kinetic energy	256	860
System analysis and battle management	99	243
Survivability, lethality, space power, and logistics	112	258
Management	11	9
Total	1.400	3,722

BUDGET BREAKDOWN

To some, this may appear to be an overly ambitious expansion. This assuredly is not the case. The SDI is a multifaceted research program, not a business-as-usual weapons development effort. As a research program, resources are allocated and utilized more quickly than in a procurement endeavor.

In fact, in fiscal year 1985 the SDI had obligated nearly 40 percent of its budgeted resources by the end of the first quarter. Actually, we have now gone beyond that point as we are approaching the point in time that we are now in the fiscal year.

This is unprecedented in a program of this magnitude and certainly shows that the program is on track, vigorously pursuing the objectives that have been set forth, and clearly able to execute at the pace that has been programmed.

PROGRAM ELEMENTS

Further, as a multifaceted program as opposed to a single product development, it is critical that all elements of the SDI be orchestrated in a coordinated, phased approach. To provide the information necessary for our Nation to make an informed decision with respect to moving ahead with development of a strategic defense against ballistic missiles, all aspects of relevant technology must be comprehensively developed to yield results in a logical order.

Elements of the program are truly interrelated. Delays caused by reductions in given areas will ultimately delay attainment of overall program objectives.

At the same time, within major projects in the program, a complete effort must be maintained as well. For example, development of a space-based sensor is dependent, in part, on an integrated sensor, which is in turn dependent on focal plan technology, which is built on technology supporting new development of arrays, submodules, and modules.

Multiply this by nearly a hundredfold and one begins to get an idea of the complex interrelationships that intertwine throughout the program.

Finally, some in Congress would argue for deep reductions in the program that has been structured to carry out the SDI, particularly with respect to experimental demonstrations. While this may stem from an honest lack of understanding, such measures would cripple the program. Experiments must be conducted demonstrating technological adequacy to comprehensively validate technologies that would support a thoroughly reliable and effective multilayered defense, the importance of which I emphasized to you on April 2.

Technologies must be stressed in the appropriate environment to develop such information. Without such experimental tests, the necessary foundation cannot be provided for you and a future President to make an informed decision with respect to possible development.

Along these same lines, there are those who would unnecessarily limit and inappropriately focus the thrust of the SDI. To specifically address a hard point defense of strategic military targets, for example, would be incomplete and programmatically redundant if that were restricted only to that type of effort.

Furthermore, if technologies supporting a multilayered defense to prove viable, then people as well as military assets would be protected.

As we continue intensive examination of these technologies, we build on the foundation established by Dr. Fletcher in the defensive technologies study. We are doing this, in no small measure, through the SDI systems architecture studies.

HORSERACE ACQUISITION

The contractors were awarded a phase I contract in December 1984 to perform the SDI systems architecture and key trade-off studies—known as the "horserace" acquisition. The purpose of this procurement is threefold:

Provide an initial definition and assessment of several alternative constructs of systems architectures that can detect, identify, discriminate, intercept, and negate ballistic missiles in their boost, postboost, midcourse, and/or terminal phases.

Provide a complete and balanced set of technological and functional requirements by developing the key tradeoffs for sensors, weapons, command, control, communications (C^3), and supporting subsystems that can make the individual architecture a viable and cost-effective strategic defense system.

Define and prioritize critical technical issues that must be resolved before decisions can be made on whether or not to implement a given defensive strategy.

The horserace procurement is a phased acquisition approach. It is divided into two phases with the second being a unilateral government option. Phase I is a concept definition phase not to exceed $1 million. Period of performance ranges from a minimum of 6 months to a maximum of 12 months.

Phase II, the detailed definition study, is planned to last 12 months. It is a priced option not to exceed $5 million. Approximately four contractors will be selected on the basis of quality and timeliness to proceed into phase II. The emphasis on timely completion gives rise to the comparison with a horserace.

In conclusion, I continue to be excited by the challenge and the responsibility for bringing this much needed initiative to fruition.

In accomplishing this goal we will have pushed the level of technical achievement across a spectrum of technologies that are broadly applicable to defense needs. We will have resolved many outstanding issues about the future role and impact of such emerging technologies as directed energy.

And, of course, we will give a future President, Congress, and our allies the necessary ingredients for taking the first step on the road to eliminating the destablizing threat of ballistic missiles.

I am pleased that I have had and will have the opportunity to work with you and your staffs, so that together we may ensure that the Nation and our allies understand what we are doing, why we are doing it, and how we plan to evaluate whether we have succeeded. I am looking forward to engaging in that challenging dialog between opponents and advocates that will ultimately define that criteria for success.

PREPARED STATEMENT

I have prepared testimony which I will submit for the record.

Senator **Stevens**. Thank you, General. It will be inserted in the record at this point.

[The statement follows:]

Prepared Statement of Lt. Gen. James A. Abrahamson, Director, Strategic Defense Initiative Organization

Thank you Mr. Chairman for the opportunity to again appear before your committee. If I may, I would like to highlight a few points with respect to the strategic defense initiative, or SDI, to build on our session of April 2.

Since the President's speech in 1983, we have seen many interpretations of what his vision entailed and what the SDI was expected to accomplish. In spite of what would appear to be many conflicting reports, I would like to emphasize that our goal has not changed and has, in fact, remained consistent with the direction outlined by the President. The driving force behind his concept is freeing the world from the fear of nuclear conflict. Our ultimate goal is the elimination of all nuclear missiles. To move toward this objective, then, the SDI has been structured as a program of vigorous research focused on advanced defensive technologies with the aim of finding ways to provide a better basis for deterring aggression, strengthening stability, and increasing the security of the United States and our allies. I would again stress that the SDI is a research program geared to provide a future President and Congress the technical knowledge required to support a decision on whether to develop and later deploy advanced defensive systems. Such a deployment would enhance and strengthen deterrence while also providing critical leverage for truly meaningful reductions in nuclear weapons.

Now, as a research program, the SDI is not a weapons development program, nor is it a program with preconceived notions of what a potential defensive system against ballistic missiles should entail. Emphasis in the program is being given to nonnuclear weapons for defense. The defense that might evolve from the SDI will not be intended to defend only our strategic weapons systems nor is it a program that we feel should lead to an arms competition in space. We are considering ways to defend both ourselves and our allies against the ballistic missile threat. As the work moves ahead, we are in full consultation with out allies. It is a research program designed to answer numbers of scientific and engineering questions that must be addressed before the promise of new technologies can be fully assessed. Finally, all the research in SDI will be carried out in strict compliance with our obligations within the ABM Treaty. An appreciation of these tenets is essential to an understanding of the SDI.

Even those who may be termed by some as critics of the program, accept this view. They would feel that the SDI "should be an initiative that supports prudent and high-quality research into ballistic missile defense that can provide options to future Presidents and future Congresses."

Since assuming the position as director of the program last year, we have made every effort to convey such an understanding of the program. The importance of the

SDI and the implications for future peace and stability cannot be overstated. Nonetheless, our budget sustained a 21 percent reduction in its first year. There is clearly damage done by these fiscal year 1985 cuts. We tried to minimize that damage by managing the reductions in accordance with the following:

—For new starts, we delayed the initial implementation.

—For existing programs we either delayed program enhancements designed to tailor the program more closely to SDI needs, or we stretched out or temporarily interrupted the progress of such programs where it was possible to do so without disrupting the integrity and continuity of the program. In one particular case—the demonstration of advanced acquisition, pointing, and tracking, known as talon gold—we severely limited the scope of the existing program so that we could provide a major restructuring of our efforts.

—For some programs we continued to fund at the rate indicated in our fiscal year 1985 budget request, because they are fundamentally important to decisions which must be made in the early stages of the SDI Program.

While we were generally successful in meeting our overall strategy, achieving the planned funding levels in fiscal years 1986 has become much more important if we are to continue the goals, time lines, and tasks of the SDI.

In spite of the reductions, we have continued to move ahead as rapidly as possible with the program, in the short time since its inception, the SDI has made remarkable progress. The commitment and dedication of those involved with every element of the program is evident. In continuing to build on this solid foundation and very encouraging beginning, we estimate that the SDI will cost about $26 billion between fiscal years 1985 and 1989. Elements are again summarized as follows:

[In millions of dollars]

	Fiscal year 1985 appropriation	Fiscal year 1986 request
SDIO program:		
Sensors	$546	$1,386
Directed energy	376	966
Kinetic energy	256	860
System analysis and battle management	99	243
Survivability, lethality space power and logistics	112	258
Management	11	9
Total	1,400	3,722

To some, this may appear to be an overly ambitious expansion. This assuredly is not the case. The SDI is a multifaceted research program, not a business-as-usual weapons development effort. As a research program, resources are allocated and utilized more quickly than in a procurement endeavor. In fact, in fiscal year 1985 the SDI had obligated nearly 40 percent of its budgeted resources by the end of the first quarter. This is unprecedented in a program of this magnitude and certainly shows that the program is on tack, vigorously pursuing the objectives that have been set forth, and clearly able to execute at the pace that has been programmed.

Further, as a multifaceted program as opposed to a single product development, it is critical that all elements of the SDI be orchestrated in a coordinated, phased approach. To provide the information necessary for our Nation to make an informed decision with respect to moving ahead with development of a strategic defense against ballistic missiles, all aspects of relevant technology must be comprehensively developed to yield results in a logical order. Elements of the program are truly interrelated. Delays caused by reductions in given areas will ultimately delay attainment of overall program objectives.

At the same time, within major projects in the program, a complete effort must be maintained as well. For example, development of a space based sensor is dependent, in part, on an integrated sensor, which is in turn dependent on focal plane technology, which is built on technology supporting new development of arrays, submodules, and modules. Multiply this be nearly a hundred fold and one begins to get an idea of the complex interrelationships that intertwine throughout the program.

Finally, some in Congress would argue for deep reductions in the program that has been structured to carry out the SDI, particularly with respect to experimental demonstrations. While this may stem from an honest lack of understanding, such measures would cripple the program. Experiments must be conducted demonstrating technological adequacy to comprehensively validate technologies that would support a thoroughly reliable and effective multilayered defense—the importance of which I emphasized to you on April 2. Technologies must be stressed in the appropriate environment to develop such information. Without such experimental tests, the necessary foundation cannot be provided for you and a future President to make an informed decision with respect to possible development.

Along these same lines, there are those who would unnecessarily limit and inappropriately focus the thrust of the SDI. To specifically address a hard point defense of strategic military targets, for example, would be incomplete and programmatically redundant. Furthermore, if technologies supporting a multilayered defense do prove viable, then people as well as military assets would be protected.

As we continue intensive examination of these technologies, we build on the foundation established by Dr. Fletcher in the defensive technologies study. We are doing this, in no small measure, through the SDI systems architecture studies.

Ten contractors were awarded a phase I contract in December 1984 to perform the SDI systems architecture and key tradeoff studies—known as the horserace acquisition. The purpose of this procurement is threefold:

—Provide an initial definition and assessment of several alternative constructs of systems architectures that can detect, identify, discriminate, intercept, and negate ballistic missiles in their boost, postboost, midcourse, and/or terminal phases.

—Provide a complete and balanced set of technological and functional requirements by developing the key tradeoffs for sensors, weapons, command, control, communications (C^3), and supporting subsystems that can make the individual architecture a viable and cost-effective strategic defense system.

—Define and prioritize critical technical issues that must be resolved before decisions can be made on whether or not to implement a given defensive strategy.

The horserace procurement is a phased acquisition approach. It is divided into two phases with the second being a unilateral Government option. Phase I is a concept definition phase not to exceed $1 million. Period of performance ranges from a minimum of 6 months to a maximum of 12 months. Phase II, the detailed definition study, is planned to last 12 months. It is a priced option not to exceed $5 million. Approximately four contractors will be selected on the basis of quality and timeliness to proceed into phase II. The emphasis on timely completion gives rise to the comparison with a horserace.

In conclusion, I continue to be excited by the challenge and the responsibility for bringing this much needed initiative to fruition. In accomplishing this goal we will have pushed the level of technical achievement across a spectrum of technologies that are broadly applicable to defense needs. We will have resolved many outstanding issues about the future role and impact of such emerging technologies as directed energy. And, of course, we will give a future President, Congress, and our allies the necessary ingredients for taking the first step on the road to eliminating the destabilizing threat of ballistic missiles. I am pleased that I have had and will have the opportunity to work with you and your staffs, so that together we may ensure that the Nation and our allies understand what we are doing, why we are doing it, and how we plan to evaluate whether we have succeeded. I am looking forward to engaging in that challenging dialog between opponents and advocates that will ultimately define that criteria for success.

U.S. COMPLIANCE WITH ABM TREATY WITH SDI

Senator Stevens. Do you have some slides, general?

General Abrahamson. No, sir. What we have this morning is in case there are some discussions on compliance, we brought along Mr. Minichello who is in the Office of the Under Secretary of Defense for Research and Engineering. He does have some slides, but I think those are most appropriate if you raise certain questions.

Senator Stevens. You say compliance.

General Abrahamson. Compliance on our side, our testing.

Dr. Ikle. If the question comes up.

Senator Stevens. Just assume that the question has been asked.

Senator Proxmire. What is the question?

Senator STEVENS. The question basically is concerning compliance by the Soviets with the ABM Treaty. You are looking at the other side of it, are we complying with the ABM Treaty in SDI?

General ABRAHAMSON. Yes, sir.

Senator STEVENS. You mentioned both in your statement.

General ABRAHAMSON. We presented that information in our closed session in terms of the detailed information and I believe the President's report is perhaps the best and most authoritative way to deal with the operation.

Senator STEVENS. I understand that, but in the closed session I indicated I thought we ought to have some form of explanation of the Soviet issue in this open session.

Are you prepared to do that today?

Dr. IKLE. Mr. Chairman, as I mentioned in the opening remarks, the Soviet large radar at Krasnoyarsk has been found to be in violation of the ABM Treaty. The President so reported to Congress early this year. The construction of that radar is continuing.

The explanations we received from the Soviet side are unconvincing. This is one, in a larger context, of noncompliance problems that we face in the arms control area and that we must address over the months and years to come.

In greater detail we could give you in a classified session a fuller description of the Soviet program of strategic ballistic missile defenses as well as tactical ballistic missile defenses that indicate both noncompliance and the growing Soviet interest in defense systems.

Senator STEVENS. We have followed a policy to allow questions to be asked of the witnesses in accordance with the time that we arrived at the hearing. Senator Rudman was the first one here.

Senator Rudman.

NEGATIVE REACTIONS AGAINST SDI

Senator RUDMAN. Thank you very much, Mr. Chairman.

We had a rather long hearing yesterday. You are familiar with the people who testified yesterday? They raised a number of points about which it is certainly worth hearing your response to today. I think essentially you could put what they said in three broad general categories.

In the first instance they make the assertion that SDI as it is presently planned is destabilizing on its face. They give reasons for that.

Second, and I think the most disturbing point they made, is that they believe under certain circumstances it is easily defeated if the Soviets are willing to spend large sums of money.

And the third thing, I guess, has to do with the whole issue of compliance and whether or not what you are doing truly conforms and complies with the treaty.

Let me start with the third point and work back up.

In the 1972 treaty there is an agreed statement which I am sure you are familiar with. It is curious and ironic that that statement essentially, if you look at the history of the negotiations, is unilaterally an American initiative which the Soviets neither agreed or disagreed with, but said, fine. If you want to have that statement attached to the treaty as an addendum, fine.

It was our initiative—let me read it to you:

> The parties agree in the event ABM systems based on other physical principles and including components capable of substituting for ABM interceptor missiles and ABM launchers or ABM radars are created in the future, specific limitations on such systems and their components would be subject to discussion in accordance with articles 13 and 14 of the treaty.

Now, it seems to me that we are exactly in that mode right now. At least in the mode that if your efforts are successful, then we continue to be bound by that particular addendum to reopen the treaty based on whatever you develop.

I would like to hear your comment on that.

Dr. IKLE. You are correct, Senator, about the history of that provision and that it was on our side that argued in favor of it. The negotiating record, as is always the case, has some relevance as to the scope and meaning of the treaty.

We are engaged in continuing a further analysis of this question. Just on the face of it, of course, the statement itself, the short statement you read, could be interpreted in more than one way.

Senator RUDMAN. Let me interrupt you there.

MEANING OF TREATY

If that is your answer at that point, are you saying that that doesn't mean what it says it means or it means something else?

Dr. IKLE. It says what it means, yes. It may mean different things to different readers. The specific limitations will be subject to discussion is what it says.

The next question is with the new systems, what limitations would apply to them prior to the satisfactory conclusion of these discussions?

Senator RUDMAN. Quite frankly, there isn't much difference between international law and practicing law in New Hampshire. The meaning of words generally is their obvious intended use.

Let us look at the words. I am a supporter of this initiative. I have some concerns here.

This says in 1972 when many of these theories were only theories that if in fact there was future technology other than conventional missiles, which is what the Soviets with their GALOSH system and we with our system, that if new technologies came onboard—obviously, people knew about lasers in 1972, they certainly knew all forms of directed particle beam activity and energy activity that was then being theoretically looked at, the fact of the matter is that is specifically what we have in mind—they say that if any systems based on other physical principles, "other" meaning other than conventional rockets with either conventional or nuclear-tipped warheads on them, that is what they were talking about, and my question, I will be very specific, is:

If, in fact, in the next 3 years or 10 years you develop, let us say a particle beam device or laser device that essentially will work, it is now the position of the administration, is it or is it not, that you are bound to go back to the Soviets under article 13, and say, OK, we have this new system, we want to talk about deploying it. What is the issue?

That is the question. That gets down to the specifics.

Dr. **Ikle**. It is our position that future possibilities for ballistic defense are to be a subject of discussion with the Soviet Union and specific limitations in accordance with the agreed statement, would be the subject of discussion.

Our position in Geneva now, indeed, is to address the possibility of an agreed transition that would lead to an increasing role of strategic defenses in our strategic relationship. Our preference is to have this condition phased in consensus with the Soviet Union in the most stabilizing and effective manner, efficient for both sides.

So far the Soviet Union has not agreed to enter into this, but we should not be discouraged from their preliminary reaction because if you look back some 10 or 15 years earlier Soviet spokesmen stressed precisely that we should agree to have effective defenses to reduce offensive systems.

FUTURE OPTIONS UNDER TREATY

Senator **Rudman**. The obvious next question in this: If at some future date a system is perfected out of this great body of research going on that in fact works, that an American President at that time thinks ought to be deployed, that the Congress supports, then under article (d), you would have only two options:

Option one, to ask the Soviets for a waiver of the present ABM Treaty and its limitations. Failing to get that waiver, vitiate the treaty, under the terms which allow that to be done, and proceed with the deployment of that system.

Is that correct?

Dr. **Ikle**. That is essentially correct. The waiver—I would put it in somewhat different terms, an agreed procedure for a stabilizing position.

Senator **Rudman**. Senator McClure has very wisely observed that saying we won't deploy it after spending so many billions of dollars is rather unrealistic. That brings me to my second question.

I imagine I am almost out of time. I will direct this to General Abrahamson because it ties in with the first question.

Testimony yesterday from witnesses who have, I think great credibility, was that if in 1990 or 1995 it looks like these systems we had were going to be successfully deployed or in fact before then if it appeared they were going to work, the Soviet response would be in the area of countermeasures to deploy up to 100,000 warheads. This would be in violation of the treaty which they would then vitiate in their national interest and several hundred thousand or a million decoys at great cost.

I want to ask you a question, not whether or not they would do that, because your guess is probably no better than anybody else's. When it comes to second-guessing the Russians, I don't think any of us are very good except that lately they tend to do what they say they will do and they have said that is what they will do.

My question is this: General, in 1990 or 1993 under the system you are now looking at if the Soviets decide rather than go some other way, they are going to defeat it with brute force. They have a lot of surplus throw-weight in their missiles. If they decided to deploy a lot of their additional measures and countermeasures where are we then with the system you are hypothetically looking at now?

General **Abrahamson**. That is the challenge of the program. That is why we are embarked on a research program at this point rather than saying we ought to just march right out with some of the technologies that are nearer term and more mature and say let us go ahead and deploy it. Because we have to be able to understand that the technologies would be robust enough that we could deal with that kind of question.

FLETCHER COMMISSION

If I might, let me go back to the Fletcher Commission itself. When the Fletcher Commission looked at the overall study and began to look at these emerging technologies, they did not assume that the threat we are talking about is either today's threat or a simple extrapolation of that. They, in fact, multiplied that threat by a very substantial amount.

There is an extensive exposition of countermeasures, many of the same countermeasures, by the way, that have been talked about recently. The critics didn't invent these countermeasures, we did. We are including in the research program a very active program to make sure that they can't be simply or easily applied.

Let me give you one example. I showed in my unclassified session an example where we are doing this in fact. The question of a space-based laser and its application is a promising context. It is one that one looks at very carefully in order to ensure that a space-based laser could not be easily countered by some of the concepts talked about by our critics. In the Fletcher report we are doing an analysis by exposing potential thermal armor, essentially for what might be missiles, to laser energy trying to understand what are the limits, where are the practical limits of what you could do to a ballistic missile and see if those practical limits are high enough so that they would effectively counter a space-based laser.

Then when we understand that, we will drop the space-based laser concept. That is one of the reasons for going forward with several parallel approaches at this point in time because we have not completed all of that work.

We are not operating just from taking where they are today and where intelligence says they may go. We are operating to the limits of technology. That takes a great deal of effort and it is probably the most central issue in the program.

So, I can just try to assure you that we are considering each of those.

Senator **Rudman**. Gentlemen, thank you very much.

My time is up. I would just add in answer to a question to the entire panel yesterday, they all agreed one of the things we have to be concerned about is what they call the general area of nasty surprises.

SOVIET LASER RESEARCH

We know the Soviets are engaged in massive research, particularly in lasers. Obviously, the program has to continue. The debate with this Congress is how it continues and whether it has, in terms of events, a destabilizing effect and consider what effect it has on the ABM Treaty. Those are the issues that we have to confront, not whether the program ought to go forward. Those are separate issues. Thank you very much.

Senator **STEVENS**. Thank you.

Gentlemen, I have just come back from Geneva where I have been observing, as one of the observers appointed by the Senate, the arms control negotiations. I have to tell you it is my judgment now that we are going to be involved in negotiations with the Soviets for a long period of time. Not that I am negative about this negotiation, I think we will succeed eventually in getting another agreement, but it will be another of a series of agreements.

Taking that into account, and this is an open session, how much have we disclosed about what we know that the Russians are doing in the same area of research that is encompassed now in what is known as the strategic defense initiative?

General **ABRAHAMSON**. Obviously, "Soviet Military Power" is a step in that direction.

Dr. **IKLE**. It is in this publication issue.

Senator **STEVENS**. I have read it. It is interesting to have an explanation of it here.

They are involved in lasers; is that right. We know they are involved in lasers?

General **ABRAHAMSON**. Yes, sir. Let me provide a brief summary.

THIRD VERSION OF SOVIET MILITARY POWER

Senator **STEVENS**. We are in the third version of "Soviet Military Power"?

General **ABRAHAMSON**. Yes, sir, in the third version. We have extracted parts of that particular book and included it in our report to the Congress that deals with the defensive situation.

SUMMARY OF SOVIET POWER

Let me provide a very brief summary.

First of all, of course, the Soviets are embarked on and have maintained the world's only ballistic missile system. They are in the process of not merely upgrading that system, but replacing the major elements of the system. The radars are not being just simply upgraded, they are being replaced by huge new radars and there are sketches of those radars in the publication itself.

They have what appears to be a very full and capable system of not only detection, but also what could potentially at least be command and control that is available throughout the entire country. Obviously, that is a concern that goes beyond just simple concern of the violation associated with radar at Krasnoyarsk.

They have gone a step further and have now established a sufficient enough capability in command and control and in warning and in pointing and tracking so that they could very broadly deploy a ballistic missile and ECM capability, one that goes beyond the maximum allowed numbers of sites around Moscow.

Senator Stevens. You are talking about a total territorial defense of the Soviet Union; is that right?

General Abrahamson. Yes, sir.

Senator Stevens. That would be violation of the ABM Treaty?

General Abrahamson. No; there are holes in the treaty that allow some very interesting kinds of development.

Again, and I will read a section from "Military Power" that is also here that deals with the SA-X-12.

Senator Stevens. Can you pull that microphone up?

Dr. Ikle. I have the story here essentially in my statement that the Soviet surface-to-surface missile, SA-X-12, can incorporate ballistic missile capabilities. It is nearing operational status.

Briefly, the SA-X-12 is a tactical surface-to-surface missile and antitactical ballistic mission. It may have the capability to engage the Pershing I and Pershing II in an antitactical ballistic missile system. The SA-X-12 has the potential to intercept some types of U.S. strategic missiles as well.

Senator Stevens. If they wanted to deploy what they are working on now, they, too, would have to negotiate with us?

Dr. Ikle. No; they could violate the treaty.

Senator Stevens. You say they could violate the treaty. The Senator asked three options, either not deploy it, negotiate with us, or violate the treaty.

Dr. Ikle. Right.

Senator Stevens. They would first have to negotiate with us if they wanted to tie together the SA-X-12 and their Krasnoyarsk radar as a new ABM site. They could negotiate with us and we would say we understand.

Incidentally, I might tell you it is my judgment that they put that radar there because of the high cost of putting two out on the periphery. They could have put the two out on the periphery without our concern; is that right?

Dr. Ikle. That is right.

Senator Stevens. The knew what they did—they should have negotiated. It is not totally in violation yet, it is not operable, is it? It does not become a violation until it becomes operational?

Dr. Ikle. The construction itself is a violation.

Senator Stevens. The construction itself is a violation?

Dr. Ikle. Right.

Senator Stevens. What I am saying is that you are in the process now, are you not, of researching a series of things that are comparable to what the Soviets are researching? Is that not correct?

General Abrahamson. What I did not get to as I went through in my discussion was the Soviet potential ability to upgrade or to utilize dual use systems such as the SA-X-12 and their existing systems. In addition to that they are very actively engaged in laser research of many different kinds and they have been doing this more aggressively than we have for a long period of time.

In addition, we know that they are working in other areas such as neutral particle beams and potentially x-ray lasers. Therefore, you are correct in saying that, yes, they are proceeding in research in many of the same areas that we have and in some areas they are probably ahead of us.

Senator **Stevens**. They have been longer than we have been in some areas, have they not?

General **Abrahamson**. Yes.

COSTS OF SDI PROGRAM

Senator **Stevens**. That gets to the basic question of this committee and that is cost. This year you have a request that goes up substantially. This research and development money is 2-year money, it is my understanding?

General **Abrahamson**. Yes, sir.

Senator **Stevens**. You have explained in your statement what you had to do last year when the Congress cut you back. You have already known that the authorization committee is indicating a cutback.

What has been your track record on the 1985 money as far as expenditure of it to date, General?

That was a fairly substantial increase from the previous year.

General **Abrahamson**. As I indicated, in a general sense I believe that we are ahead of every other agency in the Department of Defense that has a need to place a large number of small contracts as opposed to a few large ones, in that we are obligating in the first quarter slightly under 40 percent and we are continuing to move ahead in a very dramatic way.

I think what that indicates is that the kind of management arrangement that we have is working. That is where we have a centralized small group who are making priority decisions and working with a decentralized organization that is throughout the Army, the Navy, the Air Force, NASA, where that is required. Department of Energy, many other areas, and there are very highly competent technical teams that we can call on.

Senator **Stevens**. I have just one more question and my time is up.

HORSERACE ACQUISITION

In your statement you mentioned a series of studies known as the horserace acqusition. It is an unfortunate term.

It is my understanding there are 10 different participants in that. They are funded, are they not, by the Department?

General **Abrahamson**. Yes, sir.

Senator **Stevens**. Why do we have to fund 10? Why wouldn't five have done the studies or three or four? Why is it you have so many, such a multiplicity of participants?

General **Abrahamson**. This particular effort is the first real attempt to get an indepth analysis of various technologies so that we can indeed begin to make judgments about the cost effectiveness and the trades between many of these various systems.

The Fletcher report, while it was an outstanding technical road map, it did not provide the indepth systems used so that we could begin to make choices.

Senator **Stevens**. Let me ask you this, General. Are those 10 entities assessing different alternatives or are they assessing the same alternatives?

General **Abrahamson**. They are using their imagination in terms of applying the best mix of different alternatives.

By the way, this is only $10 million that is involved in this effort. That is a lot of money, but each of these contracts is only $1 million. It is a fixed contract. It is a horserace because I want to get the best product as quickly as possible.

Senator **Stevens**. The impression in your statement was that it was much broader than $10 million.

General **Abrahamson**. I am sorry if I gave that false impression, but we do need the differing judgments of people with different experience levels different technology concepts, that is, what is the value, and that is why we have a large group.

Senator **Stevens**. Thank you.

Senator Proxmire.

Senator **Proxmire**. General, in your statement on the first page you state:

> Since the President's speech in 1983, we have seen many interpretations of what his vision entailed * * * I would like to emphasize our goal has not changed and has, in fact, remained consistent with the direction outlined by the President. The driving force behind his concept is freeing the world from the fear of nuclear conflict. Our ultimate goal is the elimination of all nuclear weapons.

SHARED SDI TECHNOLOGY WITH SOVIET UNION

My first question is the President and Secretary of Defense Weinberger both said when we get this research perfected and developed we will provide it to the Soviet Union.

Do you still feel that way?

Dr. **Ikle**. Let me answer this question, Senator.

The President has elaborated on this question, I believe it was last fall, in one of the Presidential debates. He put it in the clear context in which I understand he meant it, namely, that we do not seek a defensive system for superiority over the Soviet Union.

If and when the Soviets agree to abolish offensive arms, we could work together with them to operate the defensive systems that would protect against cheating and perhaps against third powers using ballistic missiles against either the Soviet Union or the United States.

Senator **Proxmire**. When the Soviet Union agrees to abolish their offensive nuclear arsenal, then we would give them the defensive technology?

Dr. **Ikle**. That is elaborating, in a sense, the end point of the transition that we are now negotiating on with the Soviet Union, the reduction of offensive arms and the joint movement toward defensive systems.

Senator **Proxmire**. So that they wouldn't have the defensive system in place, the SDI system in place, for some years because after they got the technology, then they would have to do the production and they would have deploy it, and so forth.

Dr. **Ikle**. I am concerned that they might have it much sooner. They are working vigorously on strategic defense and they have more things in place than we now have. They are spending about as much on strategic defensive forces right now as they are spending on strategic offensive forces. They have not, therefore, agreed with us that defenses are to be avoided.

Senator **Proxmire**. Is there any realistic indication of any kind that the Soviet Union would agree to destroy its offensive missiles in return for something like this?

Dr. **Ikle**. If there is any hope for arms control, there has to be a reduction in offensive arms. In 1972, we thought we could facilitate limitation on offensive arms by banning ballistic missile defenses. We have now learned that that approach didn't work.

Senator **Proxmire**. Are you saying we would give them the SDI before they would destroy all of their offensive missiles?

Dr. **Ikle**. That is a question of transition. It is premature to specify the detailed phases of these steps and what kind of cooperation we could arrange much further down the road. I think it would be premature to elaborate on that.

Senator **Proxmire**. You can understand why some of us are pretty skeptical about that kind of agreement with the Soviet Union in view of their record, and this Senator is certainly one that is skeptical about it.

No one ever asked about the President's claim that the goal is the elimination of all nuclear weapons.

Are you really serious about that? All nuclear weapons?

You recognize there are at least six nations that have nuclear weapons now. The gifted undergraduates at Princeton and Harvard have both designed nuclear weapons. All they need is plutonium to make it effective. The genie is out of the bottle.

How are you going to abolish nuclear weapons?

Dr. **Ikle**. The President has pointed out one of the virtues of moving toward reliance on defenses is precisely that having defensive systems, hopefully in an agreed arrangement, an agreed transition, would protect you against the kind of cheating that you are properly referring to.

Indeed, we have to consider that some nations, including the Soviet Union, might hide and cheat on such an agreement and hide additional nuclear offensive arms. It is for that reason it is more realistic to go to strong arms control reductions in offensive arms if you do have defenses than if you do not.

Senator **Proxmire**. Is it not much more realistic to realize we are going to have to live with nuclear weapons?

In the land of the blind a one-eyed man is king. Any little country that has a nuclear weapon when they are abolished has a lot of power. It seems to me the real confidence should be in proceeding with arms control recognizing we are going to have to live with the nuclear weapons, as the Harvard study concluded 5 or 6 years ago in a book they wrote.

Dr. **Ikle**. That is the spirit behind the initiative, the move behind arms control to provide against possible cheating by the Soviet Union or other major power after we have reduced part of or all of our offensive system.

ENGINEERS AND SCIENTISTS NEEDED FOR SDI RESEARCH

Senator **Proxmire**. Mr. Jastrow yesterday dissented from a higher estimate of the number of engineers and scientists you are going to have to use if you get the $3.7 billion. He said that we only have to have an additional 11,700, I think it was, scientists and engineers.

Another response was an estimate that you need 40,000. Whichever figure, it is a collossal number of scientists and engineers, presumably many people who in many cases would be competent if they were people who are now doing scientific and engineering research in other military areas.

You would be robbing part of your defense to build up SDI, would you not?

General **Abrahamson**. Sir, the most comprehensive study of the impact of manpower and facilities has been done by the Congress. We were very pleased to participate in providing information for that particular study. It was done by the investigative staff of the House Appropriations Committee. They have not released that yet.

Obviously, we have worked with them quite carefully. We feel that while there will be some impact and, yes, we do want some of the very best people working on the program, their study does not indicate that it is incredible or an impossible or any kind of problem, breaking it out much more specifically than just engineers, but by other talents such as physicists, electrical engineers, breaking down into smaller areas.

General **Abrahamson**. This drain would go on for a number of years, would it not. You have $3.7 billion in 1986, $4.9 in 1987.

How much overall would you request in the next 5 years? Do you have that figure?

General **Abrahamson**. Yes, sir; we indicate in our initial request we thought it would be on the order of $26 billion in the initial 5 years. That 5-year budget is a matter of record.

Senator **Proxmire**. You said:

> All the research in SDI will be carried out in strict compliance with our obligations within the ABM Treaty. An application of tenets is essential to an understanding of SDI.

Just yesterday Gerard Smith, who negotiated that treaty under President Nixon, said he has not been consulted by the Defense Department on the treaty and treaty violations, and so forth.

Why shouldn't you, and Dr. Ikle, and others who have great authority in this respect consult the man who negotiated the treaty for a Republican President and who obviously is an expert in this area and who could give you, it seems to me, some very useful advice on violations?

He has made the charge at times that we are in violation right now.

General **Abrahamson**. First of all, I have had the great pleasure, and, by the way, I respect Ambassador Smith very, very highly, of having informal discussions with him on precisely these areas.

We have also opened up our test program and presented information to people who are at least in the group of people who are critics of the program and have spent a long time in discussions with them about what it is we are doing within the limits of classification. I believe that there is a fairly broad knowledge of what we are doing.

Now, we have not formally and officially called in Ambassador Smith, but I assure you again, based on very profound respect, that I have had discussions with the Ambassador.

Senator PROXMIRE. I appreciate that. At least this Senator would urge that you consult closely with him. He certainly is a wise and experienced person.

SOVIET TREATY VIOLATIONS

Let me ask you this: In a front page article in the New York Times on Sunday a report was made by Bill Teller indicating that we intend to cite Soviet violations of the ABM Treaty as a basis under national law for our violations of the treaty.

The article indicated it would not come down the pike until 1988, but on that basis that we had the right under international law to violate the treaty in different areas than they did if we wished to do so because the Soviets have violated the treaty.

Is that the policy or position of the Defense Department?

Dr. IKLE. Senator, I think that article referred to our report to Congress on SDI Program, pages B-2, B-3, that do discuss the problem of Soviet violations and the fact we have to guard against permitting a double standard of compliance under which the Soviet Government could get away with various violations of an arms agreement, including the ABM Treaty, while the United States continues to abide by all provisions indefinitely.

That is a serious problem. I feel noncompliance with a number of agreements, the biological weapons agreement, ABM Treaty, and others, is very, very serious and is not being addressed with sufficient concern.

The one thing that will make the entire arms control process unreliable and become meaningless is if we cannot cope with the fact of noncompliance.

Senator PROXMIRE. My time is up.

Let me just say the one sure way of unraveling the arms control process is for either side to assume violations on the part of the other. The Russians claim they are not violating it, I think they probably are. But on the assumption that we go ahead and violate it, then, of course, the treaty collapses.

My time is up.

Senator STEVENS. Thank you very much.

General ABRAHAMSON. Sir, I think it is important to point out we are not violating the treaty.

Senator STEVENS. I think that is important.

Senator PROXMIRE. The article said it was not until 1988 we would become involved, if we did then.

General ABRAHAMSON. That reporter is hardly an expert, in my judgment.

Senator STEVENS. We are not violating the treaty now.

Dr. IKLE. We have no intention of violating the treaty. The U.S. Government does not violate treaties, in my view.

If we wish to address noncompliance by the other side, we will do it in a legal way.

Senator STEVENS. Senator D'Amato.

Senator D'AMATO. I yield to Senator McClure for at last one question.

Senator MCCLURE. The question is why now?

You know, it is absolutely asinine, totally inexplicable, that any rational person could say to the Soviet Union, "Go ahead and violate the treaties, gain whatever advantage you wish. We will never make any plan to retaliate or to respond in kind."

I am not advocating that we abrogate the treaty, but I am saying we must continue to advocate that when their violations of the treaty affect our national security in an adverse way, we are free to take actions that are necessary to protect our country.

I just don't understand the notion, gee, we have a holy obligation to make ourselves less defensive than we ought to be because we entered into a treaty that they are free to violate.

Senator STEVENS. Senator D'Amato.

I think that is going to elicit some comments along the way.

Senator D'AMATO. Thank you, Mr. Chairman.

SOVIET R&D IN DEFENSIVE TECHNOLOGIES

According to Mr. Keegan's article in "Aviation and Space Technology," the Soviet Union has been pressing ahead with research and development in defensive technologies for quite some time.

Is that true?

General ABRAHAMSON. The answer is yes.

Senator D'AMATO. Now, can you be more specific and give us some of those areas?

General ABRAHAMSON. In indicated that the areas that we are perhaps the most concerned about in the advanced concepts of the SDI are areas of laser research and areas of neutral particle beams.

It could be argued from the Soviet viewpoint that laser research was for other applications. I would point out that neutral particle beams can only be operated in space and, therefore, their concern about weapons in space and that our research is in fact militarization of space, I think is a little disingenuous.

SOVIET INVOLVEMENT IN LASER PROGRAM

Senator D'AMATO. How many people are involved in their laser program?

General ABRAHAMSON. The actual numbers I believe are classified because they talk about our sources. I would like to provide that in a classified fashion for the record, but our general conclusion is that they have had many more people involved in laser and other directed energy systems than we have for a longer period of time.

Senator D'AMATO. A substantial number?

General ABRAHAMSON. Yes, sir. I can give you an example of perhaps the results of that kind of investment. Again, this is talked about in the publication "Soviet Military Power."

At Sary Sagen they have a very large research on a ground-based laser that has been in operation for a very long period of time. It has a beam director and can point upward, and it has been assessed that it could potentially be damaging to low-flying U.S. satellites.

We do not have in any place in our research program yet a beam director hooked to a very large ground-based system that would allow you to conduct the kind of research that that one does. We are proceeding under this program, but it will be about another year until we finally have one of these developed.

SDI EFFECTIVENESS AGAINST CRUISE MISSILES

Senator D'AMATO. Let me ask a question with respect to the effectiveness of SDI in general as it relates to its effectiveness with the depressed trajectories or cruise missiles.

How would you respond to those who might ask, why would you pour these moneys in if indeed it would appear to be that there is a glaring hole, that being cruise missiles or even the manned high-flying bomber?

General ABRAHAMSON. First of all, we have always considered that the most dangerous and destabilizing threat that we are faced with is the prompt one, the one that arrives with the tremendous power of the entire ballistic missile inventory as quickly as it does.

Therefore, it has also been the area that has been considered to be really very difficult perhaps impossible in the past, using old technology, to begin to counter. Therefore, this initiative is aimed at that most difficult problem.

We are not ignoring the question of the other threats. At this point in time there are studies going on in the Department of Defense on how best to counter air-breathing kinds of threats. They have not been elevated to a major program of this kind yet because I think the first question is to deal with the ballistic missile.

Once we gain confidence and once we understand how some of the technologies that we are developing in this program may provide some additional ability to either detect or be part of that that contributes to the solution of those, then I think it would be a logical place to begin to tackle those as well.

If you go back in history, we had an extensive air defense system in this country in the 1960s. It was a good defense system. We gave it up and the reason we gave it up was because it was expensive. The conclusion was that the Soviet ballistic missile threat was so profound that there wouldn't be anything really left to defend.

That is why we think that the right order to tackle this problem is to deal with the ballistic missile threat first and as you gain confidence, you can deal with that and see if the movement toward this technology will allow a cost-effective solution to other threats as well.

SOVIET SPACE LASER THREAT AGAINST SDI

Senator D'AMATO. Going back to the Soviets and the development of their laser systems and the danger that that development poses to the United States, what kind of potential threat does what the Soviets are working on present to our own strategic defense system, that which we are undertaking now or looking at?

General ABRAHAMSON. Let me make sure I understand the question, sir.

Senator D'AMATO. What is the potential threat of the systems of the Soviet laser, what do they pose to us?

General **Abrahamson**. I think the answer to that question can be made by dividing the technologies they are working on into two categories.

The first category is the one of mature technology and it is the situation that I mentioned where they have not only maintained, but also upgraded and expanded in terms of other weapons and the development of rapidly deployable weapons so that they have now postured themselves in a position where they could expand their defenses on a broader basis if they wished to in a much shorter time than we could in terms of reacting with a kind of defense.

Now, that would be only a partially capable defense. I think the significance from a military viewpoint is this: That they are less worried about a first strike from the United States and that partial capability kind of threat could be overcome with some important investments and obviously a different targeting strategy than we use now.

But a partial defense could be terribly effective against a ragged retaliatory strike. Therefore, the real implication of their near-term potential with the technologies which are near, in hand to them is to reduce in a very significant way the effectiveness of our potential retaliatory strike.

Now, because they have historically, ever since the days of the Tartars, believed in defense in depth and understand the relationship between defenses and offenses and it has served the Soviet Union well in several world wars in the modern era, they also know that they should proceed and, obviously, they are proceeding with some of the advanced technologies, as we are as well.

If they were successful in doing that, they would be able to put a much more effective defense in place, one that would take the final step really in nullifying our retaliatory capability should they choose to do that.

Therefore, it is prudent that we develop the kinds of technologies that we are working on. We are not trying to use the simple mature technologies that the Soviet Union is because we feel that we indeed have a different kind of threat that we defend against.

We need to be able to defend against the threat that they have presented in all of their writings and that is first strike; therefore, we must be more effective.

Senator **D'Amato**. Mr. Chairman, it seems to me possibly that we do ourselves a great disservice and handicap ourselves in attempting to build public support that in many respects powers the decisions that this body and the Congress in general undertake, what funding level should we put it that, by not making known to the public as fully as I believe we could exactly those areas of activity that the Soviet Union is engaged in, the free resources, personnel, manpower, with some more specificity.

SOVIET DEVELOPMENT OF PARTICLE BEAM DEVICE

Senator **Stevens**. Let me interrupt you and go to one in the classified area that I told you I wanted to discuss. That was that as early as the 1960's the Soviets published a paper which indicated they had made a significant breakthrough in the area of a device that is usable as a particle beam device concept.

Without treading on the intelligence community, can you tell us a little bit about that?

It is not significant from the fact that I am trying to get any intelligence information, I think the significant fact about this is that that was back in the 1960's they were that far ahead of us.

General **Abrahamson**. Yes, sir; the work that we are doing under the SDI in the neutral particle beam weapon concept includes several improvements in several Soviet developments.

RADIO FREQUENCY QUADROPOLE

One of those is called radio frequency quadropole. That is a device which allows the Soviets to replace what were very, very large volumes of equipment in the scientific accelerators of the late 1950's and the early 1960's, about three stories worth of equipment, replace that with a small extension about as big as from me to you members of the committee, and as I indicated, that came out in their literature as early as 1969.

So, we have a little reverse technology flow here, but it does indicate their emphasis in these areas.

By the way, they have now closed all that open literature in these areas as they are continuing the work.

Senator **Stevens**. That concept is now part of our SDI research?

General **Abrahamson**. We have incorporated what they invented in Project Whitehorse which is now operating out of Los Alamos.

Senator **D'Amato**. Mr. Chairman, again it is clear, I honestly believe that in certain cases we oversanitize, we don't let the public know the kinds of massive research the Soviets are embarked upon.

I understand we have to protect sources, but sometimes I think we use that "protecting source" when we would not be jeopardizing our intelligence community.

The American people are entitled to know what is taking place, the kinds of massive commitments that the Soviets are making in these SDI programs so that the dialog, exchange of thoughts and information as to whether we are moving in the right direction based on fact and not just sitting behind secrecy, because the public doubts us in many cases.

I think this committee should urge and I would hope the Defense Department would urge that we open it up more and make more of these facts available.

Senator **Stevens**. Senator Hollings.

Senator **Hollings**. Thank you, Mr. Chairman.

SOVIET SUPERIORITY IN DEFENSIVE SYSTEMS

Isn't that the case, Dr. Ikle, here in the United States rather than starting an arms race in space with respect to the SDI, in fact what we are doing is playing catchup to the Soviets; is that right?

Dr. **Ikle**. Absolutely. Let us keep in mind the Soviet Union never gave up on strategic defensive systems. As I mentioned, since we signed the ABM Treaty they have spent as much on defenses as on offenses, a large part of it to be sure on air defense, but a small part on all these research programs in ballistic missile defense that General Abrahamson referred to.

In addition, since signing the ABM Treaty they increased the number of warheads and now have about 500 percent more missile warheads, indicating that they clearly did not agree with the spirit of the ABM Treaty; namely, to stop the arms competition.

Senator HOLLINGS. Dr. Ikle, I am interested in two things, slow down and speed up.

First the slow down. Some of us were trying to speed up the Carter administration to go into ballistic missile defense. Senator Wallop and I and others had research funded through this subcommittee at about the billion dollar level over a period of time. Witnesses from the Redstone Arsenal told us that by 1988, I think it was a point defense, BMD, ballistic missile defense capability could be deployed. That is when the Army had it.

My question is: Since you have given it to the Air Force, have you slowed it down?

Dr. IKLE. I think General Abrahamson said——

Senator HOLLINGS. You are the one in charge. I know what his answer will be.

Dr. IKLE. We have shifted emphasis from more traditional technologies, you are correct, to the more advanced technology, the reason being that the traditional technology can be more easily overcome with Soviet countermeasures and, therefore, could lead to this kind of stepped up competition that some of your colleagues, Senator Proxmire and others, are concerned about; namely, the effort at ballistic missile defense merely accelerates the competition and the Soviets will quickly overcome it.

We want to leapfrog beyond that situation by going to these advanced technologies that the General referred to which cannot be overcome cost effectively by the Soviet Union and, therefore, dampen the competition.

For that reason you are right we have probably done less on that approach than you had in mind some 10 years ago.

Senator HOLLINGS. We don't have the 1988 deployment now. In other words, politically are you trying to defend yourselves from Congress or are you really trying to slow down the Army or what?

General ABRAHAMSON. No, sir; that is not the case. What we are trying to do is to ensure that the development of the last layer of a layered defense is brought forward hopefully with nonnuclear means, and, by the way, that is a much more difficult task, and, therefore, much of the money is being spent in ensuring that we can do that and do it effectively so that we limit collateral damage here in the United States to our own systems, but we are trying to ensure that that goes forward at an appropriate schedule as part of an overall layered defense area.

The funding has increased from over the last several years. I can't comment on what it might have been intended to be 10 years ago.

Senator HOLLINGS. Have you slowed the Army down at all, General?

General ABRAHAMSON. I have taken certain of the very specific projects in an attempt to try to allocate money reasonably and to absorb the 21-percent cut that we got last year, yes, I had to slow down some of the projects not only in the Army, but also in the Air Force.

Senator HOLLINGS. You have Army folks in the audience smiling.

Let me ask you about speed up. Unfortunately, and I say respectfully, Secretary Weinberger, I may have put the wrong net over him, but I gain the impression that we have a Secretary of Defense that says, look, I am going to let the contracts and the nature of defense contracts being what they are, it will take us, even if the Democrats ever take over, about three Democrat administrations to either complete or cancel the contracts.

So, full speed ahead, let the contracts, and as a result, we are noticing all these cost overruns, exorbitant waste and everything else. That puts you in a bad position.

Here we are with budget constraints and we start tomorrow on it and I am trying to save money and freeze across the board. Now you are jumping from $1.3 to $3.7 billion.

Senator Proxmire and others have an amendment to cut that in half. How do I defend that cut in half?

If I am going to vote on that Proxmire amendment, why should I vote against it?

PROGRAM CUTS

General ABRAHAMSON. Sir, I would like to offer for the record some very specific evaluations of what the cuts might involve should that particular authorization proceed as it is laid out.

[The information follows:]

IMPACTS OF ALTERNATE SDI AUTHORIZATION ACT FOR FY 1986

Program Element	SDIO 1986	Alt. Auth Act	Impact
SDI	$ 3,722M	$ 1,860M	($2,300M)
- SATKA	1,386M	680M	(710M)
--AOA	192M	120M	(72M)
--TIR	70M	6M	(64M)
- DEW	966M	450M	(520M)
--SBL	372M	169M	(203M)
- KEW	860M	310M	(550M)
--ENNK T.B.	102M	29M	(73M)
--ERIS T.B.	121M	13M	(108M)
--Hyper Vel Launcher	39M	4M	(35M)
--KKV	147M	31M	(116M)
--Ter Tech Int Proj	130M	34M	(96M)
- Hard Pt Def		75M	75M
- BM/C^3	243M	128M	(115M)
- Threat Anal Program	11M	20M	9M
- Surv, Leth, & Key Tech	258M	193M	(65M)
--Syst Surv Proj	72M	72M	--
--Leth, & Target Hard	104M	104M	--
- Management	9M	9M	--

Proposed reduction in SATKA requires that only SSTS and BSTS be funded and these two programs will experience reduced supporting technology program efforts in IR Sensor Technology and Command Technology and Architecture. TIR will be deleted as a program in 1986.

Example/Rationale:	1986	Proposed AAA	SDIO Option	Impact
SSTS	136M		136M	--
BSTS	131M		131M	--
IR Sensor Tech	151M		151M	--
Common Tech & Arch	250M		0	(250M)
Imaging Laser Tech	127M		0	(127M)
Radar Disc Tech	74M		0	(74M)
Opt Disc Tech	199M		136M	(63M)
Imaging Radar Tech	46M		0	(46M)
Optical Surv Exp	192M	120M	120M	(72M)
TIR	75M	6M	6M	(69M)
Space-Based Imag Exp	6M		0	(6M)
TOTAL	1,386M	680M	680M	

The proposed reduction in the KEW program will result in effective one-year delay of all near term technology testbed/demonstration programs. The proposed specified reductions result in an average program element decrease of 80% of planned program for 1986.

Example/Rationale:	1986	Proposed AAA	SDIO Option	Impact
HEADS T.B.	102M	29M	29M	(73M)
ERIS T.B.	121M	13M	13M	(108M)
Hyper Vel Launcher Dev	39M	4M	4M	(35M)
KKV	147M	31M	31M	(116M)
Ter Tech Integ	130M	34M	34M	(96M)
Novel Concepts	30M		30M	--
Hyper Vel Launch Tech	69M		39M	(30M)
Subsyst Eng & Anal	12M		12M	--
ExoNNK Tech	110M		62M	(48M)
EndoNNK Tech	101M		56M	(45M)
TOTAL	860M	310M	310M	(550M)

Proposed reduction in DEW Program requires that the SBL Project be decreased by approximately two-thirds and that nearer term GBL Program be reduced by approximately one-third. All other advanced technology development efforts will be deleted from the FY 1986 program. This results in a reduction of the possible technologies that can be integrated into future SDI architectures that may be defined from the "horserace" contractors.

Example/Rationale:	1986	Proposed AAA	SDIO Option	Impact
SBL	372M	169M	169M	(203M)
GBL	432M	---	281M	(151M)
S.B. Part Beam	133M	---	0	(133M)
Nuclear Driven DEC	24M	---	0	(29M)
	966M	450M	450M	(706M)

BEST COPY AVAILABLE

IMPACTS OF ALTERNATE SDI AUTHORIZATION ACT (FY86)

MAJOR TECHNICAL DEMOS DELAYED - REDUCES OPTIONS

PROMISING DIRECTED ENERGY PROJECTS DELAYED

HARD POINT DEFENSE ADDED WHILE NEAR TERM ENABLING DEMONSTRATIONS DELAYED

BM/C^3 PROJECTS DELAYED - "LONG POLE" ITEM

DOES NOT PROVIDE FOR NEAR TERM OPTION NOR ROBUST TECHNOLOGY DEVELOPMENT

DELAYS OVERALL SYSTEM DECISION POINT AND SENDS UNFAVORABLE SIGNAL TO SOVIETS

PROGRAM PHASES

General **ABRAHAMSON**. First of all, I would like to point out that I am very pleased that in the foreword to that it does endorse the concepts and the ideas. However, internally it has a major, major impact.

The first and most important thing it does is that it essentially cuts out all of the demonstration phases of the program. In some cases it is internally inconsistent in that it has directed for two program elements new starts, a hard point defense technology and a threat analysis program.

HARD POINT TECHNOLOGY

Let me point out one of the inconsistencies of the hard point technology. At the same time it is saying we should proceed with that, it eliminates the Army money from the terminal imaging radar, the key to making precisely that kind of system work, and delays very substantially—for example, it takes what was planned in 1986 at $75 million minimum for that terminal imaging radar, brought it down to $6 million, which is impossible to conduct a reasonable program.

It does a similar thing to the exo- and endo-atmospheric interceptors which are part of that program. In fact, it was cut very, very substantially. There is, first of all, an internal inconsistency in the bill, itself.

Second, what it really does is cut the demonstration phases of the program so dramatically that one could develop some laboratory technology, but not be in a position to be able to prove to Congress or even prove to our own technical people that you could proceed in the environment, proceed against countermeasures and field an effective defense.

So, it is a dramatic change. It is not simply cutting the program. It goes even further than that. I believe it goes to an unprecedented change in roles in the Congress and the executive branch in that it proposes an oversight committee that goes well beyond the many oversight committees already present, including this one, but one that imposes itself into the day-to-day management of the program.

Senator **HOLLINGS**. In terms of time, General, where does it put us?

You are on a schedule to accomplish what by what year? As a result of that being halved, how far does that extend your particular goal?

General **ABRAHAMSON**. Sir, our goals are to be able to present enough evidence across the broad range of technologies so that a future President in the early 1990's or a future Congress in that same timeframe could make a judgment about going forward with development and eventual deployment.

Senator. **HOLLINGS**. 1992?

General **ABRAHAMSON**. I am deliberately fuzzy because we are not saying we have set a goal for a particular date. Let us say early 1990's. That is a recognition of some of the difficulties of the task in terms of the broad areas of research.

This particular proposal just fundamentally changes the character of the whole program so dramatically that it is a different concept that is being proposed. It is only a terminal defense concept and, as I indicated, even major elements of the bill preclude you from proceeding with that. I could not even relate that to a schedule.

BMD FOR MX MISSILES

Senator HOLLINGS. Now, since the Congress, Mr. Chairman, apparently is now—you know, we give and then take away and limit the President to 50 MX's, a point defense for those 50 MX missiles—how soon could you provide BMD for those 50 MX missiles?

Dr. IKLE. I think if we went ahead vigorously, we could have it by the mid-1990's, Senator.

Senator HOLLINGS. By the mid-1990's?

Dr. IKLE. Yes; it would be an effective way of eliminating or certainly reducing the vulnerability of the missile.

Senator HOLLINGS. We started with 200, went down to 100, and now to 50. I am wondering how to improve the capability of that particular missile and I believe that enhancing its survivability with a capable defense system is the right way. Thank you, Mr. Chairman.

Senator STEVENS. Thank you.

Senator McClure.

Senator McCLURE. Thank you, Mr. Chairman.

DEPLOYMENT

There are a number of areas I would like to go into at greater length. One, I guess in candor, I have to at least give you an opportunity to respond on the record because I am puzzled.

I don't know that the record is clear and I can't make up my mind what the record tells me and that is whether the reasons for delay in deployment are associated, as the distinguished Senator from South Carolina indicated, with some political considerations, or whether it is a technical consideration or how you mix those two.

I know that you always have to strike a balance. You cannot get all of the money, you cannot get all of the programs you want to do to build both current readiness and a future base, you make tradeoffs in the budget all the time on that subject.

How much do you spend for current readiness, how much do you reduce current readiness in order to be able to invest in a future technological base?

I am not sure how much of that is involved. I am not sure how much is involved in the researcher's delight in research. You know, there are such. I am not sure whether you are one that is so delighted in research you would like to spend all the money there, you don't waste any money bending metal.

I don't know how much of that is involved. I don't know how much is involved in our unwillingness to confess that this is a dangerous world in which we live and we have a dangerous adversary and that when the ABM Treaty was negotiated as part of the

SALT I negotiation we had a substantial lead in technology and they wanted an ABM Treaty that would restrain us.

Today they are way ahead in research and they still want an ABM Treaty to restrain us and it is not restraining them.

Dr. Ikle wrote a classical item many years ago, "After Detection, What?" I think that is the correct title of the article.

What do you do once you find that they violate? There has to be some truth that lies between the rather mindless position that says the treaty itself is worth so much that violation of it is irrelevant or the equally mindless conclusion that any violation of a treaty should call for immediate abrogation.

I have heard both expressed in the Congress. It seems to me that a rational mind could indicate that we assess the value of the treaty against the danger of the violation, we make some judgments that say if the Soviet Union is not to be encouraged to violate treaties, there has to be some cost to them for violation, otherwise, they get a unilateral advantage.

I don't know, in the discussion we are going through now with respect to SDI, what components drive this research. Because as I see it, you are talking about a research program dedicated to the 1990's for future Presidents to make decisions about the deployment.

You are not talking about any near-term projects. Is there a short answer to that or is the answer 10 times as long as the question?

Dr. IKLE. I must agree, Senator, that we have to have a differentiated, but yet an effective policy to cope with the noncompliance by the Soviet Union. There are certain don'ts that we can say clearly. Once we find that they are violating an agreement, we should not cut back out own countervailing program.

SOVIET VIOLATION OF BIOLOGICAL WEAPONS TESTING

This is not to say that we want to do exactly the same thing they are doing. We found that they are producing and testing biological weapons in violation of the Biological Weapons Convention. We do not want to produce biological weapons, but we have to go ahead with safeguards, with protective measures, and we have, of course, a proposal on binary chemical weapons.

In the ballistic missile area this is not the time to cut back. Indeed, we know they are not abiding by the treaty.

Also, your earlier remark. I think our report to Congress agrees with what you said—we may have put it in somewhat convoluted Pentagon language—we must guard against permitting a double stand in noncompliance. We would not violate because they violate. We would take the steps legally permitted in international law or under the treaty in the event the treaty is no longer of any value.

Senator MCCLURE. Let me interrupt you at that point.

You say we will take the steps legally permitted. That says the Soviet Union can take some steps that are not legally permitted and we will not?

Dr. IKLE. We will not do it equally because it is illegal. The treaty or contract that has been broken by the other party, you are legally permitted to get out of that contract.

Senator **McClure**. You are permitted to abrogate it?

Dr. **Ikle**. Right, declare it null and void.

Senator **McClure**. Certainly you could do that, but my premise would be that there are values to the treaties even if there is partial compliance. If we determine the treaty in partial compliance is of more value to us than another abrogation of the treaty, then we might feel free to make a response short of total abrogation of the treaty?

Dr. **Ikle**. That is correct.

Senator **McClure**. That is an illegal act.

Dr. **Ikle**. Not necessarily. I think it comes under international law as a legal remedy for a treaty violation. We can make a measured response.

Senator **McClure**. You might be free of the provisions, but that ought to be a major judgment on our part just as rational as we can make it.

Dr. **Ikle**. There is another aspect which is in this report which is very important. When the Senate ratified under advice and consent the ABM Treaty, part and parcel of that ratification record was the 12 clauses and the statement made by the executive branch to the Soviet Union and to the Senate that if there are not substantial reductions in strategic offensive forces, there would be reason for making use of the clause.

Senator **McClure**. I understand that. We will get into the question of verification and what we do with respect to response. I have a standing request by some colleagues of ours in the Senate for an administration position with respect to military implications of treaty noncompliance on the part of the Soviet Union.

What does it imply to us. What does it do to our security? How do we respond to those violations?

KRASNOYARSK RADAR

One additional comment with respect to Krasnoyarsk radar. The Krasnoyarsk radar, I think it would be correct to say, is not simply a violation of the ABM Treaty in the sense that we permitted peripheral radars as early warning radars in both countries and that this one functions in that sense and, therefore, is not a serious violation because it functions not only in that sense, more economically perhaps, but also for the very reason that we required them to be outward looking, early warning radars, this one is interior and, therefore, closer to the point of attack and, therefore, a better battle management radar, not just an early warning radar.

Is that correct?

General **Abrahamson**. That could potentially be a reason for putting it exactly where it is.

Senator **McClure**. If you were in charge of their program instead of ours and you were building instead of researching, you might build one there?

General **Abrahamson**. Yes, sir.

COUNTERING OF MAD THEORY

Senator **McClure**. Let me talk for a brief moment about some mathematical equations because I am concerned about this notion that somehow that SDI is a terribly destabilizing thing because it counters mutual assured destruction, the deterrent policy that is based on our ability to deter each other by mutual assured destruction, the declassified figure of the Soviet number of warheads I believe is 6,300.

A prudent, and cautious, and conservative military commander in the Soviet side in a first strike would not commit all 6,300. Suppose they committed one-third of that, 2,100, which happens to be the number that the United States has in total in declassified information.

Suppose our SDI were deployed and is not a total shield, it cannot be. I don't think anybody claims it can be a total shield. Some will get through because of countermeasures failures of our system. Some will get through.

Out of the 2,100 that they launch, only 10 percent would get through, we would only destroy 90 percent. That means 210 would reach targets, an awesome destructive capacity. But, again, they have hundreds, indeed thousands, and I think that is declassified information, too, in targeting, thousands of targets and in order to get an assured kill, they want to put two or three warheads on each of the essential targets.

So, they wouldn't be satisfied in a first strike. They would just have 2,100 warheads for each target. In order to get the 2,100 that they could launch with one-third under the present and no defense with a 90-percent kill ratio, they would have to launch 20,100 or 21,000, 18,900 plus 210. So, they would have to have 21,000 warheads to reach the same level of saturation as 2,100 with our defenses.

The argument on the part of some who were opposed to SDI is that that is a destabilizing factor because it leads them to want to go from 5,300 to three times, 21,000 warheads, and it is cheaper for them and easier for them to go to 21,000 warheads than the 6,300 they have now, cheaper and easier for them to do that than it is for us employ defenses.

Is that a valid argument that they can easily proliferate their warheads?

General ABRAHAMSON. I think it is a much more complex situation than you even indicate with that particular scenario.

The real issue is with what confidence the Soviet Union would in the face of, a layered defense, with that confidence would a Soviet planner attempt a strike and with what assurance does he need to know that he can strike, not just get a few through, but know which one's get through to which targets.

That is the key elements. That is why we think against that the layered defense is so very important because what happens is that to get any confidence level through a two-, three- or perhaps four-layered defense, even though they may be able to calculate as you did and say, yes, I can assure that one might be able to get through or two or a certain number, 200 or any particular number, they can't know which ones and, in fact, the probability goes up into the hundreds of warheads in order to assure that they get even the particular one that they are after.

Therefore, I reject the idea that it is a simple matter for them, just in the face of a layered defense, to increase just a few warheads.

I think the number would be so massive that if we had an effective layered defense, they would prudently look for other options. I think those other options are what we would like them to look for, defenses as opposed to offenses.

Mr. **Ikles**. Let me add one comment, Mr. Chairman.

When we had spent about half of our strategic money on defenses in 1960, air defenses in those years, the Soviets became so discouraged about getting through with their bombers, they stopped their bomber program. Contrary to this theory about defenses being destabilizing, they did not encourage them to compete by building more.

Senator **Steven**. Gentlemen, we will have to go to Senator Sasser.

Senator **Sasser**. Thank you, Mr. Chairman.

SDI EFFECT AGAINST CRUISE MISSILES

Gentlemen, I think you have generally conceded that we can't have a leak-proof strategic defense, that some warheads will get through and what we are discussing here is a defense against a warhead coming in by way of intercontinental ballistic missiles, coming in from the upper atmosphere.

We, and I think you, will concede that this defense would not be effective against cruise-launched missiles, is not effective against bombers and would not be effective against low trajectory submarine-launched ballistic missiles. So, we still have to deal with the cruises, the low-trajectory submarine-launched ballistic missiles, and the bombers in another way.

How effective would the strategic defense system be, what percentage of warheads would be knocked down by this system, in your judgment, if it were deployed, warheads coming in by way of ICBM's?

General **Abrahamson**. That is the importance of the President's goal. By saying, can't you make nuclear ballistic missiles impotent and obsolete, he has given us a goal that says see if you can find technology which will be effective enough to be able to stop as many as is humanly possible.

My judgment is that as we proceed, certain of the technologies, mature technologies, will allow us to start on that process. Obviously, we wouldn't want to start with a trivial defense. It would have to be robust and mature.

Then with the more advanced technologies and some of the innovative things we are working on in the future they would go further. It is impossible at this point in time to predict, within whatever limits of affordability exactly where we will go but the important thing is our goal is to work on technology that will give us a hope that over an extended period of time a system could be very, very effective.

Now, please don't misinterpret that this goes back to the point that Senator McClure raised. This does not mean that we intend to put all of our money or only a trivial amount of money in the more mature technologies that would allow us to start in the near term. We are, in fact, investing across the whole range.

In my judgment, in order to show the Russians that we would not start and then run out of technology and have to level off at some 30 percent or 50 percent or some number like that. We have to have in each year's appropriation an appropriate amount in mature technologies, the thing that we could begin to deploy early. Also some is needed for advanced technologies that would come along later, but allow us to move from that first partial plateau up to the next step.

You are investing in very high payoff, but perhaps chancey things in the future in innovative areas. So, each year you should try to have some of each element so that they know and don't get the wrong signal that the right response is just to add a few more ballistic missiles.

I am not answering your question, because I don't know the answer yet, but the goal is the important thing, the goal is to make it as reliable as we can possibly and humanly make it.

EFFECTIVENESS OF IN-PLACE SDI SYSTEM

Senator **SASSER**. Former Secretary of Defense Jim Schlesinger has indicated that it would cost, in his judgment, a trillion dollars to deploy an effective SDI or to deploy a SDI. As I recall, he makes no judgment about how effective the trillion dollars would be.

But you can't give us today an estimate of how effective that would be? That is, what percentage of warheads would be knocked down?

Dr. **IKLE**. Of course, that depends on the Soviet response. One of the objectives is to dissuade the Soviet Union from continuing the competition, building newer and better ballistic missiles.

In 1972 we thought we had accomplished that through the ABM Treaty. We were wrong. They come in with a new missile every year. They have been encouraged to accelerate or continue the competition in ballistic warheads, because we stopped defenses.

Now, the General explained with the more advanced and more mature near-term technology, it becomes attractive for Soviet planners to try to continue to out-compete us. But they might continue for a while. If they do so, it will take us longer to get to the higher percentage you mentioned. If they agree with us to facilitate the condition, it will cost us much less and take less time.

Senator **SASSER**. Dr. Ikle, if we build a system, I think we would all agree that it is highly unlikely that the system is going to be leakproof, that there is going to be a substantial percentage of missiles that will get through and it has been published in unclassified documents that the Soviets presently have 10,000 warheads with 100,000 decoys.

Do we have any realistic hope of stopping a substantial number of those warheads?

General Rogers, our NATO Commander, has said if this defense can't be made at least 60 percent effective, don't bother with it. We have great competition here for the defense dollar.

General Rogers is very concerned that going forward with this SDI is going to strip away funds that are badly needed for modernization of our forces in NATO and other areas. These are questions that we have to answer.

Dr. **Ikle**. These are important questions.

Senator **Stevens**. Did you say General Rogers made a statement against SDI?

Senator **Sasser**. No; my statement was that General Rogers had indicated if it was not 60 percent effective, that we ought to look at it very critically.

Dr. **Ikle**. In looking at the percentage of effectiveness, you have to consider what is the Soviet objective. Do the Soviets just want to get 5 or 3 percent of their missiles through to cause urban destruction, but failing the military purposes of their attack?

Not a rational planner. It is only through a rational planner that deterrence can work at all.

General Rogers has to be equally concerned about the possibility that Soviet ballistic missiles in the theater can become so accurate that they can use conventional warheads and in one strike destroy a great deal of our military assets in NATO.

For that reason alone we have to be concerned about ballistic missile defenses even if thinking in the conventional region alone, not just the nuclear area.

General **Abrahamson**. I would like to add some comments to your point, Senator.

I can share and understand why you are concerned and why you should be concered with what an eventual cost of such a system might be and obviously what the effectivenes might be. But those are answers that come after a research phase. At that point in time we can give responsible answers for those kinds of questions.

I can tell you now we are not aiming for something that is less than 60-percent effective. We are aiming for, truly we use the phrase, thoroughly reliable, very, very effective defenses.

The first options based on some of the mature technologies, even there we would hope that they would have a 60-percent kind of effectiveness. But effectiveness in that simple calculation of how many get through is not the way to look at it, as I have been trying to illustrate and Dr. Ikle also commented on.

The problem that you must look at in terms of deterrence is what kind of complexity does it give to a Soviet planner so that it provides so much uncertainty that he will not strike in the first place?

Senator **Sasser**. Let me ask a follow-on question.

VULNERABILITY OF SDI SYSTEM

After we build this system and it is of concern to the Soviet planners, what do we do about the vulnerability of the system?

We are told that it is much easier to shoot down one of these systems than it is to put one up.

What is to stop the Soviets from knocking the system down? What are we going to do about the vulnerability of it?

General **Abrahamson**. Sir, the people who are telling you, that are making assertions, and they are interesting kinds of assertions, they are saying in fact offense can always overcome defense. I am not aware that that is a third law of physics that that has to be true.

Now, the research program, one of the reasons it is expensive is because we are dealing with that in a very serious way, not just these assertions, but we have a very extensive program examining where they could go so that we can assure ourselves that there is no simple Achilles heel. That is, again, a reason that this a research program rather than a commitment to deployment right now.

I should like to point out I am not a researcher even though I may use that word time and time again. I have had the good fortune to be associated with the development of both satellite missiles and airplanes and bring them into production and deployment. That is my real interest, but I want to ensure that I can bring to the Congress at some point in time, and hopefully not forever or decades later, good solid options. Options that are not only going to be an assertion that we can do this, but evidence that it can't be easily countermeasured and that it is affordable. That is why a substantial amount of the research is aimed at bringing down the cost of these options into something that is reasonable.

I can understand the confusion. We are not yet in a development program. Those questions are what you ought to ask. I was the F-16 program director and the Congress did ask because I was the F-16 program director, what is the cost of this airplane going to be?

I don't know what that airplane is going to look like. I don't know what the SDI is yet going to look like because I don't know which of these options will be the most cost effective. Therefore, I have to carry a number of parallel options.

Now, I have a responsibility to you and this Nation to ensure that I don't just research these to death and don't carry them on only because it is an area of interest to a group of researchers. We will make those selections just as quickly as it is prudent and is reasonable.

By the way, some of these system studies, such as the horserace studies and others that I have indicated, are tools to help make those judgments. That is why I have tried to incorporate different kinds of procurement concepts, things that will speed up the answer so that we will put the money where we can get the highest payoff.

Some of them, by the way, will begin to come out this summer.

Senator STEVENS. I want to recognize Senator Andrews. Before I do, since I have to go to another meeting, I will ask Senator McClure to chair the balance of the hearing.

SUPPORT IMPERATIVE FOR SDI

My exposure the two times I have been there has indicated an overwhelming interest of the Soviets in your program and necessarily so. I think the most important function that the Department of Defense is pursuing now is to try to see if it is possible to have a nonnuclear response to potential nuclear attack by a missile system, by something that comes through space.

It does seem to me that we must have every possible support to go forward with this. I appreciate one thing you have done. I was in Atlanta, you know, with the two Presidents, President Carter and President Ford, and I heard repeatedly people talk about star wars I, star wars II, star wars III. Those people who oppose SDI have a way of hearing something different every time someone talks about it.

I am pleased to have you come back and address the fact this is the same program that was outlined here following the President's comments in 1983. That to me is a real service, thank you very much.

Again, I think there is going to be delay. Sometime before we get this to the floor we are going to have to have show and tell, General. I really think there are some of these things that are to the point now where at least we might have something more than a response to what Senators Rudman, and D'Amato, and others have said, that there is something more out there on the table to talk about, and to see, and to have our friends in the media carry to the public.

There have been a couple of them brought to my office. I have one sitting on my desk I think the concept is there to at least let some people see some of the things you are thinking about. I think we may get more support here in the Senate than you realize from that kind of operation.

So, I would welcome your suggestions along those lines for a later hearing.

Senator Andrews.

Senator **Andrews**. Thank you, Mr. Chairman.

That, as the chairman said, of course, is the challenge that we all face. We have to protect the public's right to know and we have to assure the public we know what we are doing so that they will support what we are doing or it won't be done.

Mr. Secretary, it is good to have you back. Fred, you and I have been on these kinds of things since General Abrahamson was a lieutenant colonel, I would imagine. We have had the privilege of visiting across this witness table for over a decade, a decade and a half. We have gone through a number of different systems that we have been discussing in this kind of atmosphere.

We have come as a nation from a point where we relied on mutual assured destruction where we hold people hostage and say, boy, if you take a potshot at us, we will incinerate you. It is a lousy way to live. The only thing that is good about it is that it has worked for some three decades.

SOVIET DECOYS

Now, the point has been raised, what do we do about Soviet decoys? Quite frankly, Mr. Secretary, isn't it that we don't know what we can do about Soviet decoys until we have the research in hand to make the proper kinds of decisions? Isn't that essentially what we are talking about today?

Dr. **Ikle**. Yes, Senator Andrews. As General Abrahamson was saying, too, the purpose of the SDI Research and Technology Program is to be able to be as specific as soon as possible on what the measures would be, what their rough effectiveness would be, how they would be protected against Soviet countermeasures and what they would cost to deploy.

Senator Andrews. The point is that we don't know at this point in time, and to go back to what you and I have talked about across witness tables in bygone years, one of them was the issue of ABM. We deployed and we put in place an operation, ABM.

Yet we agreed to a treaty that limited the defensive missiles to 100 and it cost the Soviets less to point 100 missiles at the ABM sites than it cost us to maintain the ABM sites with 100 defensive missiles. As I recall the statistics at that time, had we deployed 800 defensive missiles, the cost-effectiveness would probably have been on our side.

Is that not also essentially correct?

Dr. Ikle. I am not sure, given the traditional technology of the late 1960's, early 1970's, whether the cost-effectiveness would have been on our side of defense.

What we tried to do here with the SDI Program is to reach out for technologies and things that are in the mature stage so that cost-effectiveness calculations do favor the defense.

JUDGEMENTS ON COST-EFFECTIVENESS OF SDI

Senator Andrews. What we are looking at in this whole initiative is the research to give us the ability to judge where cost-effectiveness truly will lie in the decades yet to come.

Am I essentially correct?

Dr. Ikle. That is correct, though I would add maybe a certain note of optimism in addition to your very carefully phrased——

Senator Andrews. I am not optimistic.

Dr. Ikle. We look at these ideas and these laboratory and other experiments and technologies. We have the Fletcher report taking a first cut at putting this together and the work that General Abrahamson has been heading and I think we can say it is promising, it may work and that is why we ought to pursue it because if it does work, it will give us a way out of the present unstable, and very morally, and politically unsatisfactory situation.

Senator Andrews. Doctor, what we are talking about, and this is not coining a phrase, is deadly serious business, and we need the very best information we can have so that we make the appropriate decision.

Is that not also true?

We are dealing in the dark really right now. We don't know.

Isn't that also true?

Dr. Ikle. I agree, Senator Andrews. I would think it would be deadly dangerous to start putting blinders on us and cut back on the research so that we know even less 5 or 10 years hence than we would otherwise know.

Senator Andrews. Reading through the opening statement from yesterday's Defense Subcommittee hearing, two points were made in Dr. Gray's testimony.

One point he made is there is no technological escape from the arms race.

Another one, the problem with the arms race is the Soviet's will to compete.

Now, General Abrahamson or Dr. Ikle, the history of weapons development shows that once a substantial investment has been made in a weapon, both monetarily and politically, the momentum for the weapon becomes insurmountable. It seems to be the case even though some arguments for slowing or stopping the weapons development makes sense and can actually enhance U.S. national security through an arms control discipline.

What efforts are being made to make readily available constraints on the SDI development and deployment programs, should the United States through research find that they are not what they are cracked up to be or find that slowing or stopping these programs is in the interest of an arms control agreement down the line?

What concrete assurances can we give the American public that we are not just getting pell-mell into something where we then will keep our blinders on and go down this track?

We don't want to have blinders on us, but how do we give assurances to the general public and to the world at large that we are not going to go off on some route that we then have blinders on and can't back away from?

Dr. IKLE. I think the best assurance is that we remain flexible and keep assessing the effectiveness of what we are doing.

The very example with which you are familiar, of the old traditional ABM approach, where we didn't take advantage of what the treaty permitted because we realized it was not effective, shows that we, the Congress and the executive branch can get together and stop something if it is not worth doing as long as they keep an open mind and look at facts squarely.

I would also say the Soviets are abandoning, as I mentioned earlier, their bomber program when they thought our bomber defenses were so effective and didn't start building new bombers until we stopped defenses for 20 years. Even they give up something that doesn't work.

Senator ANDREWS. What efforts are being made to assure the Congress that SDI policy priorities are not being set to justify weapons programs now under development?

Dr. IKLE. The fact that the program has been a reorganization of an ongoing program—General Abrahamson has redirected programs that existed and set up others—shows that we have together in the Defense Department and in the national security community a constant effort going on to make the programs consistent with the larger policy objectives and not the other way around.

TRAINING OF HIGHLY SKILLED PROFESSIONALS TO MEET SPACE RESEARCH NEEDS

Senator ANDREWS. Doctor, on another subject, nowhere is the marathon in technological advancement more evident than in the aerospace industry and nowhere else do we need to focus more on human and financial resources, which is really what you are testifying on today, necessary for research, to maintain technological superiority in the coming space age. Our country needs a work force of highly skilled professionals and trained in all aspects of space technology and application.

We have in North Dakota the Center for Aerospace Sciences at our university and it is developing a space education program to help in preparing our future aerospace work force. Their goal is to develop a national center of excellence for space technology and application of resources to apply to national defense needs.

The program, of course, will have an intense focus on space technology with an interdisciplinary-oriented curriculum based on space applications with particular interest in lunar bases, space stations, and commercial applications in space.

I am informed by the people out in that department, the Innovative Science and Technology Office under the auspices of the SDI Office held a review of the SDI Program at the university last Friday.

The Innovative Science and Technology Office is making significant progress toward involving university and SDI research and with North Dakota having the only aerospace science school in the country, whose facilities and programs both are partially federally funded, I have a little interest in that.

With a need to establish critically important educational programs, exploring commercial and military space objectives, how can universities such as ours assist the SDI Program based on what you did last Friday?

General ABRAHAMSON. Thank you. I am delighted to talk about this program because I think it is really going to pay off for the whole country.

First, however, I would like to preface my comments by saying back when I was in charge of the Space Shuttle Program I had the great privilege of going to the University of North Dakota and presenting what I thought was the future in terms of a job fair for students at the particular university and also to go through the mechanical engineering department and see some of their ideas.

Senator ANDREWS. I hope you have been up there since. We now have 1,100 students in that curriculum. We are spinning off a lot to NSA and others. They are interested in this fantastic program.

General ABRAHAMSON. I am delighted you have made that progress. I have to admit I have spent so much time testifying that I haven't had time to go up there.

Senator ANDREWS. We might yield back some of our time so that you and I can go out there.

General ABRAHAMSON. I would be delighted to do that. I was born in North Dakota.

INNOVATIVE SCIENCE PROGRAM

Let me comment about Innovative Science Program.

In the fiscal 1986 budget I have allocated, assuming that we get somewhere near our appropriated request, $100 million to these efforts. That is an attempt to be able to work primarily in the unclassified areas with small businesses and with universities to reach out to a group of people that we know can contribute, can make very important contributions in many innovative areas, and to do it simply and easily and get two benefits.

The first benefit and the most important criteria is that the work must be applicable to the SDI. That is a responsible part of the program, it is a part of the program and the money you appropriate is to be used for SDI purposes. So, that criteria is the first one.

BEST COP

Second, they have to have good ideas that can really push us, particularly in the future, this last wave toward effective defense. So, to that end we have let the first consortium in the university on space power to four universities.

I have now sent out letters to Members of the Congress and the Senate on our next few consortia that we will be letting; in fact, this afternoon at 3 o'clock we will make some of those particular announcements.

We have a large number of proposals that we will continue to evaluate and I hope, obviously, that there are some good solid proposals from the University of North Dakota in that Space Sciences Center. Out of this work I believe we will get more than merely good solid research contributing to the program.

What we will really provide in addition is an opportunity for graduate students and assistant professors to work in these technologies and begin to improve that base of people that can contribute in the future to many different future areas.

I think it is an important area. It is part of my request, $100 million.

Senator **ANDREWS**. What you are saying, General, would point to the expertise of the UND staff and facility to enhance programs directed toward SDI and exploring commercial space objectives as well as exploring military space objectives.

I appreciate so much your candor in saying that. We will give you an opportunity to come back to the State of your birth, General.

General **ABRAHAMSON**. I will be delighted.

Senator **ANDREWS**. We will be more than happy to do that.

Thank you, Mr. Chairman.

Senator **McCLURE** [presiding]. There are a great many more questions I would like to go into, but I think time has run out on us.

SDI REPLACEMENT OF NUCLEAR DETERRENCE THEORY

There is one area that I do believe we must explore for the record because it is what occurred not only in discussion in this country, but discussion overseas among our friends as well and not just in the arms limitation talks in Geneva.

There is a perception on the part of some, or perhaps I should state it is the fear on the part of some that SDI is new strategy that is different from and replaces deterrence, nuclear deterrence.

Dr. Ikle, would you like to comment?

Dr. **IKLE**. Yes; I will be pleased to do so, Senator.

The objective of strategic defense is to change our reliance on the threat of offensive retaliation only to total mutual vulnerability. We have seen in the last 15 or 20 years that that is not a stable arrangement. There have been long discussions from many different sources, church groups, strategic thinkers, that it is morally unsatisfactory and could lead to major political crises.

So, the objective is to enhance also the reduction in the role of nuclear arms altogether. It has been the objective of the Reagan administration to reduce the role of nuclear weapons in our overall defense effort and in meeting our commitments to our allies by improving conventional forces, and so forth.

The objective of deterring war would not disappear at all. On the contrary, we want to strengthen the disincentive to rational military planners against starting any kind of attack, nuclear or conventional.

Defenses, properly phased in, as was pointed out in the testimony, will make it less attractive to attack.

Senator McCLURE. Would you repeat that phrase? Properly phased in?

PROPERLY PHASED-IN DEFENSES

Dr. IKLE. Properly phased in, yes. But we can do that hopefully with Soviet cooperation, but we can also do it, if need be, without their cooperation because we can go ahead with the deployment and time it in such a way that our deterrent forces would be protected, at the same time they are moving toward increasing more comprehensive defense of our territory.

NATO CONCERNS ABOUT SDI

Senator McCLURE. Dr. Ikle, there are those in Europe, and I just returned from 9 days in Europe, talking to government officials in several of the governments of friends of ours—the French are not members of NATO, but they are friends of ours, and equally concerned about defense as are the West Germans and the Italians and Great Britain where we were visiting and talking—in each instance while they don't oppose SDI, they are concerned that nuclear deterrence has given Europe stability for a long period of time, that the Soviet Union has immense conventional war superiority capability over the NATO alliance or the West, and that if we were to succeed in the research program and decide as a nation, as the United States should decide, unilaterally from Europe, that we move from nuclear deterrence to nuclear defense, rendering the nuclear weapon obsolete, that then they are extremely vulnerable to conventional attack.

I think we need to do some spadework with our friends. If I understand what we are trying to do, and I think your joint testimony this morning is very revealing and very helpful to us in understanding it, mutual assured destruction or the nuclear deterrent policy has worked, but it has not worked perfectly and those faults perceived today are that while we ought to inhibit the nuclear buildup on both sides by limitations, that those limitations have not worked.

The Soviet Union, I think, to use your figures, since the treaties were entered into have multiplied their numbers by 5½ times. They have done that under a deterrent strategy.

The mutual assured destruction has led to, some would say, or permitted, others would say, a constant proliferation of the numbers of nuclear weapons, elevating the level of the nuclear threat to the world to the point we are debating in scientific circles, such things as nuclear winter.

What we are seeking as a policy is to change that reality from constant proliferation of number of weapons to some other strategy that will provide us a deterrent rather than simply multiplying the numbers of weapons.

Is that correct?

Dr. **Ikle**. I could not put it better, but very succinctly as a result of the stability of the reliance on offensive deterrence only, you might say from hindsight, of course, war did not occur and that is of fundamental importance, but we also see from hindsight that the arms competiton was not slowed down at all, as you put it.

So, in that sense we did not have stability and we cannot anticipate in the future stability from it.

Senator **McClure**. Let me ask you one question which might illustrate the dilemma that the Europeans see and perhaps we ought to be sensitive to.

PROBLEMS WITH IMMEDIATE DESTRUCTION OF NUCLEAR WEAPONS

Let us assume that tomorrow morning in Geneva the Soviet Union marched in and said, we agree, we will do away with all nuclear weapons or at least all nuclear strategic weapons—they may keep one or the other—and here is a verifiable plan for their destruction. You come watch us bash ours up; we will come and watch you bash yours up. By January 1, 1986, neither of us will have any.

Wouldn't you be scared to death?

Dr. **Ikle**. To use your hypothetical example, if it seemed real, if it was not a hoax, something that could be easily violated like other treaties, I would not be scared.

Senator **McClure**. Don't they have a conventional superiority?

Dr. **Ikle**. I think it would be safer, but something like this would take a great many years to be realized.

Senator **McClure**. I am not talking if it takes a great many years. Let us assume that they said, by next January 1 we will both be rid of them all.

We have seen Comrade Reagan, we have listened to Comrade Reagan and Comrade Reagan is right, we have a duty to humanity to rid ourselves of this nuclear threat and we are going to do it, and they were able to convince you, skeptic as you are, convince me, doubting Thomas that I am, that indeed we could see the destruction of all those nuclear weapons in the next 6 months.

Wouldn't there be a tremendous military imbalance that would be threatening to the stability of Europe and perhaps of all mankind?

Dr. **Ikle**. The answer to the question is yes, it could not have stability by suddenly removing the nuclear weapons and their role in the defense of our allies without having the time and the will to do something about the conventional balance.

Senator **McClure**. And the budget?

Dr. **Ikle**. And the budget. The budget for maintaining a nuclear deterrence also has to be considered.

Senator **McClure**. There are tradeoffs.

Dr. **Ikle**. Right.

Also, may I add that our alliance in a way is in very good shape and, of course, we are continuing discussion with them and it has been a remarkably strong alliance for all these decades.

Throughout the history of the alliance, you will recall, that there has always been a resistance in the NATO mechanisms, NATO forums, to any kind of change, whether they talk about the flexible response strategy introduced in the 1960's which was strongly resisted, or other changes, that is part of the functioning alliance.

Senator McClure. I think they need some assurances from us with respect to what our commitment is to their defense in terms that are comforting to them, not just to us. They also would see that if deterrence is nuclear deterrence, that involves the United States and the Soviet Union directly.

If deterrence is based upon conventional warfare deterrence, the battlefield is on their territory. If we fail in nuclear deterrence, it is U.S. cities that are destroyed. If we fail in conventional deterrence, it is European land that is destroyed.

Isn't there an element of rationality to their concerns about that change in posture?

Dr. Ikle. Yes; as long as it is not carried to the extreme of the Europeans thinking they are somehow safer the more vulnerable the United States is. The idea that the more vulnerable the United States, the more credible is our nuclear guarantee, of course, is absurd.

If we are safer, we want them to be safer, we want them to be defended, then we are all better off. We are not better off by being more vulnerable.

Senator McClure. I thank you again for your testimony. We can't explore all of the questions, no matter how long we stay here today. I appreciate your testimony.

We are in the midst of a political debate about military strategy and posture. This is an untidy Government that we have where we have to convince the American public. They have to support our policies. In order to be convinced and support policies, they have to see some of the evidence.

I had one Senator who said very bluntly, I can't go back to my State and say to them, "Trust me, I know on the basis of classified information what is right for you." He said, "I won't even try it."

Perhaps some of the rest of us who are less cautious are willing to try it, but we want to express some reservations as to how successful we will be in doing it.

So, we do need more information released to the public. I think the more you can do that, certainly the more we will be able to respond.

Dr. Ikle. If you will remind us of the way in which we can present the situation more effectively we would appreciate that. Do keep reminding us.

Senator McClure. Thank you very much.

SUBMITTED QUESTIONS

The committee has additional questions to be submitted for your response. They will be inserted in the record at this point.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

Additional Committee Questions

Soviet Defense Efforts

Question: Do the Soviets place a high doctrinal and policy significance on strategic defense? Does their emphasis on air defense, ballistic missile defense and civil defense indicate that they are concerned about limited damage to their own forces and leadership?

Dr. Ikle: The Soviet Union has always considered defense to be a central part of their national security policy. In fact, the Soviet Union has spent on defensive forces an amount roughly equal to its significant expenditure on strategic offensive. Soviet efforts in defensive forces include: continuing expansion of what is already the world's largest air defense and civil defense network; deploying a new ABM system around Moscow, the world's only operational ABM system; pursuit of research and development of rapidly deployable ABM components; pursuit of a vigorous, advanced defensive technology program that is similar in many respects to the Strategic Defense Initiative. These extensive Soviet activities in strategic defense threaten the foundation on which deterrence has long rested. If the Soviets at some point in the future were unilaterally to develop and deploy an effective defense against ballistic missiles in conjuction with their other defense efforts and their offensive deployments, it would pose a very serious threat to U.S. and Allied security.

SDI and Deterrence

Question: Dr. Ikle, does SDI constitute a major change to the U.S. policy of nuclear deterrence?

Dr. Ikle: Our hope is to shift the deterrent balance from one based primarily on the ultimate threat of devastating nuclear retaliation to one in which offensive nuclear arms are greatly reduced on both sides and non-nuclear defenses play a steadily greater role. We believe the latter would provide for a more stable and reliable strategic relationship.

SDI and Stability

Question: Will effective defenses against ballistic missiles have the potential for increasing deterrence and stability? How?

Dr. Ikle: An effective defense against ballistic missiles can enhance deterrence and stability by denying an aggressor confidence in his ability to predict a successful attack outcome and by reducing or eliminating the utility of preemptive attacks. If such defenses were combined with effective air defenses they could reduce or eliminate the military utility of ballistic missiles and airborne nuclear weapons and thus significantly raise the threshold of nuclear conflict. In the extremely unlikely event, due to irrationality or accident, that such nuclear weapons would be used under these conditions, effective defenses could also make a major contribution to saving lives and reducing damage.

Transition to Strategic Defense

Question: During the transition to strategic defense, will it be essential to maintain a modern and credible offensive nuclear deterrent?

Dr. Ikle: Today, deterrence against Soviet aggression is based almost exclusively on the capabilities of our offensive retaliatory forces and this is likely to remain the case for some time. Therefore, the Strategic Defense Initiative program in no way signals a near-term shift away from the modernization of our strategic and intermediate-range nuclear systems and our conventional military forces. Such modernization is essential to the maintenance of deterrence while we are pursuing technologically feasible defensive options. Additionally, in the event a decision to deploy defensive systems were made by a future President and Congress, having a modern and capable retaliatory deterrent force would be essential to the preservation of a stable environment during the transition to a greater reliance on defensive systems.

SDI and Stability

Question: Critics of SDI charge that strategic defense would upset a stable relationship of mutual deterrence. Many argue that defense is useless, and that we must rely solely on our strategic retaliatory capability to ensure mutual deterrence. Is SDI inherently destabilizing?

Dr. Ikle: The security of the United States and our friends and allies today rests on our collective ability to deter aggression, both conventional and nuclear. Our nuclear retaliatory forces help maintain this security and have deterred war for nearly forty years. Yet we have no defenses against nuclear attack by Soviet ballistic missiles--ballistic missiles that constitute one of the major sources of instability in the strategic environment. The Soviet expansion of their ballistic missile forces continues at a steady pace and threatens to widen the imbalance in crucial offensive capabilities and increase the level of instability. The SDI offers the promise of finding technologies capable of supporting an effective defense against ballistic missiles, so that we will be able to enhance deterrence and reduce instabilities.

Transition to Strategic Defenses

Question: Could reliance on strategic defense gradually reduce our budget requirements for strategic defense forces? How do you envision the transition from a strategic policy dominated by offensive retaliation to one including defense?

Dr. Ikle: If a decision were made in the future to deploy an effective defensive capability, there would, of course, be broader implications for arms control. In this regard, effective defenses against ballistic missiles have the potential of complementing our policy of pursuing significant reductions in ballistic missiles forces. To the extent that defensive systems can reduce the effectiveness and, thus, the value of ballistic missiles, they also can increase the incentives for negotiated reductions. Should significant reductions in offensive arsenals occur, such reductions, in turn, would serve to increase the deterrent potential of defensive systems. A decision to deploy defensive systems would, of course, lead to a rather dramatic change in the structure of U.S. and Soviet military forces that would require the formulation of a new and broader U.S.-Soviet arms control environment than that to which we have been accustomed. Because the United States does not view defensive measures as a means of establishing military superiority and because it has no ambitions in this regard, deployments of

defensive systems would be most useful in the context of a cooperative, equitable and verifiable arms control environment that regulates the offensive and defensive developments and deployments of the United States and Soviet Union. This will be important both in the period of transition from an offense-dominant deterrent to one based on a balance of offensive and defensive forces and in the period following the transition when defensive systems are deployed.

Question: Do you anticipate that SDI will force a major redirection in the R&D activities of U.S. aerospace and defense contractors, research institutes and universities?

Answer: The SDI program provides the U.S. aerospace and defense contractors, research institutes and universities with the opportunity to focus their science and technology efforts towards common goals. In this sense, the SDI should result in greater cooperation and collaboration among those organizations participating in the program. It will not redirect the types of research being done.

Question: Will other non-defense R&D activities be temporarily set aside or cut back if we ramp up SDI?

Answer: There is no indication at this time that scientists, engineers, and other technical people who wish to continue to do research in non-defense R&D activities will be unable to find interesting work to perform because of cutbacks.

Question: Will our scientific and technical manpower pool be sufficient over the next five years to support the SDI program? How about a transition to full scale engineering development?

Answer: According to information available from the SDI executing agents which includes the Services, DoD Agencies, and other Government Agencies, there is generally no lack of scientific and technical manpower to perform the SDI research program. This is due, in part, to the continual transition of technical expertise from one project to another as one project ends and another is initiated in both the Government and private sectors. Large aerospace contractors appear to have the easiest time making this transition because of their relatively large manpower pools. These companies indicate that they can accommodate full scale engineering development for anticipated SDI systems. The one discipline that may suffer a shortage of qualified people for SDI and non-SDI research is that of optics. There are only two universities in the U.S. that offer advanced degrees in optics engineering and physics and they produce a relatively small amount of Ph.D. and Master degrees each year.

Question: How much does the SDI office anticipate that our S&T manpower pool will have to grow over the next five years to support the President's SDI program?

Answer: The SDI Organization anticipates that the S&T manpower pool will have to approximately double in most technical disciplines over the next five years to perform anticipated research tasks. This ranges from a low of about 1 percent of available chemical engineers, mechanical engineers, and computer scientists, to a high of about 14 percent of available physicists needed by the end of the decade.

QUESTION: Would industry experience any serious dislocations in employment from SDI that might have a negative impact on other aspects of our defense R&D effort?

ANSWER: The large aerospace industries who will be performing much of the SDI work indicate that the SDI comes at a time when other defense research projects are ending and going into a systems acquisition phase. Thus, they anticipate using the available people for SDI activities and see no negative impact on the defense R&D effort. The smaller high-tech companies appear willing to grow to accommodate SDI work, if necessary. However, people with advanced degrees in optics are at a premium.

Question: Do you anticipate that SDI will serve as an impetus for the young people to get into scientific and engineering career fields?

Answer: There is no question that SDI will be a contributing factor for young students entering scientific and engineering fields. I believe many of the research questions we are asking will be answered by the young innovative thinkers our universities are turning out.

Question: Would the attraction of the new S and T manpower into the economy have positive benefits for us in the long run, no matter what the final decision is on deploying a strategic defense system?

Answer: Yes, many of the research efforts which are being conducted with SDI funding have applications that cross all boundaries of our business and industry. These efforts will help advance technology regardless of what the final outcome of this program.

QUESTION: A recent Washington Post article describes SDI as potentially dwarfing the Manhattan and Apollo programs.

But until we reach the end of the research phase of the program, can we state with high confidence just how much an SDI defense will cost, or how large a commitment of fiscal resources will be involved?

ANSWER: No, it simply is not possible to accurately forecast the cost of a system which we have not yet designed. But those of us involved in the resarch program know that we must keep cost effectiveness as a priority throughout the program.

Question: General Abrahamson, the SDI budget request of $3.7 billion is more than two and a half times last year's appropriation of $1.4 billion. Assuming that you received all of your budget request, how much could you get on contract by the end of FY 1986?

Answer: Assuming the full $3.7 billion is appropriated for FY 1986, at least $3.6 billion will be obligated by the end of FY 1986 with tha balance obligated by December 1986.

Question: R&D money is available for two years. Could you get all $3.7 billion on contract by the end of FY 1987? Will you run up huge obligated balances for this program?

Answer: The full $3.7 billion of FY 1986 funds will be obligated before first quarter FY 1987. Unobligated balances for the second fiscal year will be less than 5%.

Question: Do you anticipate any funding execution problems, given the large size of the budget increase?

Answer: The scientific and industrial community are fully able to absorb the increase in research at a technology limited pace. Funding execution will not be a problem.

Question: What has been your track record so far into FY 1985 with last year's appropriation? How much R&D money for SDI is on contract as of the end of the second quarter? How much will be on contract by the end of the third quarter?

Answer: FY 1985 was 56% obligated at the end of the 2nd quarter, and we project the 3rd quarter position will be 83%.

Question: How much of the $1.4 billion appropriated for SDI will be obligated by the end of FY 1985?

Answer: $1383M of the $1397M appropriated by the end of FY 1985. (99%) The 14M balance will be obligated by December 1985.

Question: What kind of R&D contracts are you using on SDI -- firm fixed price, fixed price/incentive fee, or cost plus?

Answer: SDIO and its executing Agencies use both fixed price and cost plus type contracts. Historically in the R&D environment, the majority of contracts tend to be cost plus. However, we are stressing use of fixed price contracts whenever possible.

Question: For the foreseeable future, will the Space Shuttle accommodate SDI demonstration payloads?

Answer: Yes, SDI is currently planning to use the Space Shuttle for two (half cargo bays) flights per year beginning in FY 87 and expanding to four (half cargo bays) in FY 91 through FY 94.

Question: Will the Space Shuttle manifest have to be adjusted in the outyears to accommodate SDI demonstration payloads?

Will the SDI drive us to a fifth shuttle orbiter?

Answer: The SDI demonstration payloads are manifested on the STS by the USAF. This will be a continuing effort which has been ongoing for the past year. The SDI demonstration payloads requirements, by themselves, do not drive a need for a fifth shuttle orbiter. As a user, we are concerned about the nation's space launch capability which will be dependent on four orbiters and a limited number of ELVs.

Question: Could the complementary ELV -- the Titan 34D -- support SDI demonstration payloads in the 1990-1995 time frame?

How important are expendable launch vehicles to the SDI demonstration payload program?

Answer: The Titan 34D could be used to support SDI demonstration payloads in the 1990-1995 time frame. However, there are no current or projected requirements for SDI use of the Titan 34D, and there are DoD payloads assigned for each of the Titan 34D launch vehicles. The STS is the baseline launch vehicle for SDI demonstration payloads. Future use of ELVs as either boosters or target vehicles has not been fully determined at this time.

QUESTION: Do you anticipate that there will be a requirement for a heavy-lift ELV or a heavy Space Shuttle to lift SDI demonstration payloads? What about actual SDI deployment payloads?

ANSWER: There are no current or projected requirements of the SDI demonstration payloads which exceed the STS capability. If a decision is made in the early 1990s to deploy an operational system, then there are projected needs in the post 2000 time period which might require a heavy-lift ELV or heavy shuttle.

QUESTIONS SUBMITTED BY SENATOR PROXMIRE

SDI and Soviet Cooperation

Senator Proxmire: Dr. Ikle, in order for star wars to work, both its supporters and critics say that the Soviet will have to display an unusual amount of cooperation. First, they will have to reduce their offensive nuclear forcers drastically. And second, we will probably have to get them to agree to limit any counter-measures they might want to employ. Do really think we'll get them to agree to all this?

Dr. Ikle: One of the central requirements of the SDI program is that it identify technologies capable of supporting an effective defense against ballistic missiles regardless of whether the Soviets prove willing to cooperate in a mutual transition to such defenses. It is only by providing this capability that SDI can create the incentives necessary for Soviet cooperation.

SDI and Arms Control

Senator Proxmire: Dr. Ikle, according to today's Washington Post there has been no progress made so far in six weeks of negotiations with the Soviets in Geneva. The Post reported that the Soviets so far have refused to even discuss deep cuts in their offensive nuclear forces with a corresponding deployment of star wars. It looks like we're not off to a very good start at getting the Soviets to cooperate with our star wars program. Are the arms control talks stalled at this point because of the question of star wars?

Dr. Ikle: We have begun the new Geneva negotiations with a clear commitment to a serious dialogue with the Soviets. There are many difficult issues to resolve, though, and the process will require persistence and patience. We are flexible and willing to consider any serious Soviet proposals. We shall continue to work toward our goal of achieving substantial, equitable and verifiable reductions in offensive nuclear forces--both strategic and intermediate-range--that will increase strategic stability and strengthen the security of the United States, our allies and the Soviet Union. If we are going to be successful in Geneva in achieving such reductions we will have to be patient, recognizing that the Soviet Union is not likely to negotiate seriously until it becomes clear to them that propagandistic efforts to undermine support for SDI in Europe and America will not work.

Soviet Countermeasures

Senator Proxmire: Dr. Ikle, you have commented in the past about the difficulties with verifying arms control agreements. The President envisions both countries proceeding hand-in-hand deploying star systems and at the same time reaching arms control agreements on offensive nuclear forces. For this to work, we will have to verify in those agreements that the Soviets aren't deploying countermeasures on their offensive forces to overcome the defenses. How do you propose to verify against Soviet countermeasures, some of which can be developed in secret labs whose insides we'll never see? Are we simply going to have to assume that the Soviets would not develop countermeasures that would overcome our defenses? Are we going to trust them not to develop countermeasures?

Dr. Ikle: Certainly one of the most important characteristics of effective arms control is verifiability. In the event of a national decision to proceed with the development and deployment of an effective defense against ballistic missiles, it will be important to engage the Soviets in discussions for the purpose of fashioning a mutual transition to a condition marked by increased dependence on defensive forces and decreased reliance on offensive forces. Treaty verifiability will be as important in a future defensive force environment as it is in today's offensive force environment and it is a characteristic we should insist be present in any future arms control agreements we might consumate with the Soviet Union. However, it also should be noted that the SDI program is examining technologies that could support an effective defense against ballistic missiles--even in the face of Soviet countermeasures.

SDI and Offensive Force Budgets

Senator Proxmire: Star wars advocates have said that we need to deploy this massive missile defense system because we are in a destabilizing situation at the moment and we are still vuneralbe to a Soviet first strike. Therefore, we need star wars to escape our nuclear predicament. In fact, some star wars enthusiasts have said that the dangers we face going into star wars could not be worse than the destabilizing situation we now face. My question is this. Over the last four years, Congress has given the President practically everything he wanted in his defense budget. We've had a massive military buildup. Not a single nuclear weapons system has been denied to Mr. Reagan so far. Are the star wars enthusiasts saying that this massive military buildup was all for naught? Are they saying that we are no more secure in 1985 than we were in 1980--even with all the money we've spent? And that's why we have to spend perhaps a trillion dollars on a star wars defense system?

Dr. Ikle: In the late 1960s and early 1970s, the United States adopted the notion that if both we and the Soviet Union were able to retaliate with devastating power even after absorbing a first strike, that stable deterrence would endure. The novel concept that defenses should be strictly limited seemed sensible at the time for two reasons: first, it was agreed that each side should have roughly equal offensive forces and that neither side should seek to alter the balance to gain unilateral advantage; and second, there did not seem to be any alternative since the state of the art did not permit an effective defensive system. We hoped that in a world with drastic constraints on defense, as embodied in the ABM Treaty, the Soviets would agree to real reductions in offensive forces. However, as one looks at the pace of Soviet offensive and defensive force developments and deployments, our hope was illusory. The ongoing Soviet activities, particularly the deployment of large numbers of accurate ballistic missiles and all ranges and the research and development of traditional and advanced defensive systems, threaten the foundation of which deterrence has long rested. If the Soviets at some point in the future were unilaterally to develop and deploy an effective defense against ballistic missiles in conjunction with their other defense efforts and their offensive deployments, it would pose a very serious threat to American and Allied security. At a minimum, SDI program is a prudent response to the very active Soviet research and development activities in this field and it provides insurance against Soviet efforts to develop and deploy unilaterally an advanced defensive system.

Requirements for an Effective Defense

Senator Proxmire: Dr. Ikle, Ambassador Paul Nitze has said that star wars must pass two tests before it is deployed: (1) it must be cost effective at the margins and (2) it must be able to overcome Soviet countermeasures. Do you agree with those two countermeasures? Do you agree then that we should not deploy star wars if it is not cost effective at the margins and it cannot overcome Soviet countermeasures?

Dr. Ikle: Any effective defensive system must be survivable and cost-effective. To achieve the required level of survivability, the defensive system need not be invulnerable, but must be able to maintain a sufficient degree of survivability to fulfill its mission, even in the face of determined attacks against it. This characteristic is essential not only to maintain the effectivess of a defense system, but to maintain stability.

In the interest of discouraging the proliferation of ballistic missile forces, the defensive system must be able to maintain its effectiveness against the offense at less cost than it would take to develop offensive countermeasures and proliferate the ballistic missiles necessary to overcome it. ABM systems of the past have lack-

ed this essential capability, but the newly emerging technologies being pursued under the SDI program have great potential to reverse this trend.

SDI and Offensive Proliferation

Senator Proxmire: Do you agree with Richard DeLauer's statement that no defense system could hold up in the face of a proliferation of Soviet offensive nuclear forces? In other words, unless the Soviets cooperate and reduce their offensive nuclear forces star wars won't work?

Dr. Ikle: The United States would not develop and deploy any defensive system that could be countered simply. The Strategic Defense Initiative program is examining thoroughly all conceivable responsive offensive countermeasures and threats to the surviability and effectiveness of defensive systems. New technologies may enable us to develop defenses at less cost than it would take to develop countermeasures or proliferate enough ballistic missiles to overcome the defenses.

The United States continues to place the highest priority on achieving equitable asnd verifiable arms control agreements leading to significant reductions in offensive nuclear arsenals of the United States and the Soviet Union. We believe that the SDI program can reinforce this process and thereby enhance deterrence as we reduce our reliance on nuclear offensive forces.

Senator Proxmire: Apparently, the Administration's arms control impact statement, which was drafted by the Arms Control and Disarmament Agency that Star Wars and allowing the SALT II limits to expire could cause the Soviets to increase their offensive nuclear forces. Isn't this exactly the type of Soviet response that would render a star wars system ineffective, as Dr. DeLauer has stated?

Dr. Ikle: Rather than encouraging the Soviet Union to increase their numbers of offensive nuclear forces, the Strategic Defense Initiative could complement our efforts to seek equitable and verifiable reductions in offensive nuclear arsenals. This interrelationship between offensive and defensive forces has long been an important consideration in our strategic thinking and in fashioning arms control agreements. To the extent that the SDI research proves successful and leads to the capability to defend against ballistic missiles, --regardless of the deployment of countermeasures and/or more ballistic missiles--then those missiles could lose much of their offensive value. That, in turn, would increase incentives for both sides to reduce the numbers of ballistic missiles greatly.

Senator Proxmire: In the Pentagon's report to Congress last Thursday, it said that if not constrained by SALT the "number of Soviet ballistic missile warheads could increase to at least twice their current levels with only a modest increase in the number of ballistic missile boosters." Yesterday Dr. Robert Jastrow testified that the Soviets would have difficulty proliferating their offensive nuclear threat. But the Pentagon's own position apparently is that it might not be that difficult. The Soviets could double their warheads without imposing too much stress on their systems. Is that DoD's assessment now--that could easily proliferate their offensive threat?

Dr. Ikle: As the Report to Congress on the Strategic Defense Initiative makes clear, our SDI research must identify the required

functions and component-level performance of a multi-layered defensive system. That requires estimates of present and maximum possible future offensive threats and of possible near- and long-term responses to a U.S. strategic defense deployment. The Report notes inter alia that the Soviets are expected to introduce qualitative improvements to their ballistic missiles forces over the next 20 years which would allow them to increase further their offensive strike capability, if not "constrained by arms control agreements." Under the provisions of SALT II, the Soviets could double their ballistic missile warhead levels even with their current technological capability.

The Soviet offensive threat has grown tremendously since the signature of SALT I. The need to avoid further such growth and to lower the present level of nuclear weapons in the world underlies our pursuit of an agreement with the Soviets providing genuine arms reductions which would create a stable and secure military balance at far lower levels or armaments. It also demostrates the need to explore the potential for effective defenses which would reduce, or even eliminate, the military utility of ballistic missiles, and thus encourage still further reductions in offensive arms.

Any effective defensive system must be both survivable and cost-effective. In order to discourage the proliferation of ballistic missile forces, whether through an increase in missiles or in warheads deployed on existing missiles, the defensive system must be able to maintain its effectiveness against the offense at less cost than it would take to develop offensive countermeasures and proliferate the ballistic missiles necessary to overcome the defense. The technologies which are emerging may indeed reverse the cost advantage the offense has had in the past over the defense.

SDI and Arms Control

Senator Proxmire: Proponents of star wars have said star wars is what got the Soviets to the bargaining table. If that's the case, do you think star wars should be a bargaining chip at Geneva? Or should we proceed with star wars no matter what the Soviets do?

Dr. Ikle: We have not put discussions of the SDI "off limits" in the negotiations in Geneva. Quite to the contrary we seek such discussions. However, we have said that SDI will not be a bargaining chip. In the defensive discussions we intend to talk about the broad questions of defense, including defense against ballistic missiles. We hope that the discussions will prove useful in exploring with the Soviets how the SDI research program and their own efforts in this area could in the future enhance stability as well as the security of the United States, the Soviet Union and our allies. Because the United States does not view defensive measures as a means of establishing military superiority and because it has no ambitions in this regard, deployments of defensive systems would most usefully be done in the context of a cooperative, equitable and verifiable arms control environment that regulates the offensive and defensive developments and deployments of the United States and the Soviet Union.

Krasnoyarsk Radar

Senator Proxmire: The Washington Post ran a story on April 16 that said the new U.S. position is that while Krasnoyarsk is positioned in the Soviet Union in a way that is forbidden under the ABM Treaty, the facility is nevertheless an early warning facility instead of a battle management center for missile defense system. Is this how the Administration now views Krasnoyarsk? Does the Administration now believe that Krasnoyarsk does not threaten us as part of a missile defense system, but is rather a misplaced early warning system?

Dr. Ikle: The Krasnoyarsk radar is a clear violation of the ABM Treaty which, when considered in relation to other Soviet activities of questionable compliance, raise concerns that they are preparing a base for a territorial defense. Large phased-array radars were recognized during the ABM Treaty negotiations as the critical, long leadtime component of a nationwide defense. When considered as a part of the Soviet network of new large phased-array radars, the Krasnoyarsk radar gives the potential for ABM coverage of a significant portion of the Soviet Union, particularly against U.S. retaliation against a Soviet first strike. The location of the Krasnoyarsk radar seems more suitable to ballistic missile defense than to any other function. By locating it where they have, they achieve much better tracking accuracy for targets within large and important areas of the USSR than they would have achieved with a location consistent with the provisions of the ABM Treaty.

SDI and Arms Control Violations

Senator Proxmire: What if the Soviets launched the type of SDI demonstration projects we are planning to launch with SDI. Would we be screaming violations? Is it likely that the Soviets will do the same?

Dr. Ikle: The Strategic Defense Initiative, as directed by President Reagan will be conducted in a manner which is fully compliant with our international treaty commitments including the ABM Treaty and the Outer Space Treaty. Article V of the ABM Treaty prohibits development, testing and deployment of ABM systems or components which are sea-based, air-based, space-based or mobile land-based. The 1972 Treaty does permit research short of field testing of a breadboard model or prototype. The type of research envisaged under the SDI program can and will be conducted within the treaty constraints.

The Soviet Union is engaged in a research and development program in both traditional and advanced defensive systems. It is important to note that the Soviet Union is: upgrading what already is the world's largest air defense and civil defense network; upgrading the world's only operational ABM system; pursuing research and development on rapidly deployable ABM components; and pursuing a vigorous advanced defensive technology program that is similary in many respects to the SDI program. The U.S. government has determined that the Soviet Union has violated the provisions of the ABM Treaty through the siting, orientation and capability of the Krasnoyarsk radar and has probably violated the ABM Treaty prohibition on testing SAM components in an ABM mode through the number of incidents of/concurrent operation of SAM and ABM components and has potentially violated the prohibition on mobile land-based ABM systems or components by their work on a rapidly transportable ABM system.

Due to these findings, our objective in the negotiations in Geneva is to reverse the erosion of the ABM Treaty and to seek equitable, effectively verifiable arms control agreements which will result in real reductions and enhanced stability.

QUESTION: Gen. Abrahamson, we hear a lot from the SDI supporters about all the promising new technologies that make a star wars system a realistic alternative. Can you put this in perspective for us? Can you give us a capsule summary of where we are now in star wars technology and how many orders of magnitude we're away from having the technology to deploy a militarily effective star ways system? And in making your response can you categorize it in terms of the critical technological hurdles star wars would face:

1. Surveillance, acquisition and tracking
2. Directed and kinetic energy weapons technology
3. Battle management and control of the entire system
4. The scaling and power requirements needed
5. The survivability of the system

ANSWER: The Strategic Defense Initiative (SDI) is a research program which seeks to (1) expand and accelerate the progress of relevant technologies; (2) identify and evaluate the potential effectiveness of candidate ballistic missile defenses that could be assembled and deployed from those technologies; and (3) show how these defense options can be operated and maintained to do the job. This research program encompasses a complex set of technologies of varying levels of technical maturity. The program cannot be appropriately characterized by a limited description. Recognizing this, we attempted to provide the details you request in the 1985 Report to Congress on the Strategic Defense Initiative, pages 29-74. Finally, we would note that characterizing progress required in terms of "how many orders of magnitude" are needed is quite inappropriate. In some technologies a factor of two may be critical or in others, several orders of magnitude of progress may be simply a matter of time.

QUESTION: There seems to be widespread concern within the scientific community over the value of space-based chemical lasers, because of their vulnerability and the fact that so much hardware and chemicals would have to be put in space for such a system. Even Dr. Edward Teller, an enthusiastic supporter of star wars, has said that space-based chemical lasers are not the way to go. Yet under the Administration's SDI budget request, we are plunging ahead with a demonstration project with space-based chemical lasers and we're doubling the budget for these type of lasers in FY86. Is it wise to be doubling this budget from one year to the next when there is so much skepticism and concern about the feasibility of space-based chemical lasers from people like Edward Teller?

ANSWER: We believe it is wise to pursue the space-based chemical laser project to the point where we can make decisions based on experimental results rather than on what we believe are premature and biased judgments. The space-based laser concept has the potential ingredients for an effective concept for boost phase intercept because: (1) current missile designs are vulnerable to relatively unsophisticated SBL concepts which thus provide initial performance levels capable of handling simple modifications of existing missiles intended to reduce High Energy Laser effectiveness, and (2) the concept promises long term growth potential to performance levels that can be successful against missiles with significant design changes made to defeat boost phase intercept (e.g. fast burn boosters). Furthermore, lasers are one of the few concepts that can reach into the atmosphere to expand the available time for intercept and also to engage other targets such as aircraft.

In addition, the Space-based Laser (SBL) program contains the technologies common to all boost-phase DEW concepts (Acquisition, Tracking, Pointing, Fire Control, Large Structures Control, and C^3-Surveillance interfaces). More than half of the program funding is applicable and essential to other SDI concepts. Furthermore, the program provides technology base development designed to satisfy many other SDI needs.

We are prepared to wisely invest the increased funding in space lasers. The program has a five year legacy of development planning behind it, starting in 1980 when Congress requested a study on how the development might be accelerated. It is the most mature concept for boost phase intercept in terms of definition and program planning.

Finally, one might also characterize the dialogue in the scientific community as also having a component of people with equally "widespread" concern that the space laser concept will be prematurely reduced or cancelled. The program is not "plunging ahead with a demonstration project" as you suggest but proceeding in a well planned program designed over five years to resolve key technical issues before decisions are made to proceed on a major demonstration project.

QUESTION: Let's look at another demonstration project SDI is pursuing vigorously--exoatmospheric non-nuclear kill vehicles. Last summer we had a successful demonstration of such kill vehicles with the Army's homing overlay experiment. In effect, we demonstrated that a bullet could hit a bullet. But is that the critical hurdle we face in the midcourse defense? Isn't the problem of hitting the target peanuts compared with the problem of discrimination--separating the decoys from the reentry vehicles? Are we plunging too quickly into demonstration projects for midcourse kill vehicles before we have a clear idea of what kind of hurdles we have to overcome in surveillance?

ANSWER: Midcourse defense is the process of detecting and destroying a reentry vehicle after its deployment from the post-boost vehicle, and we are, therefore, pursuing research in both of these functional need areas (for a detailed discussion of these functional needs please refer to pages 15-21 in the Report to Congress on the Strategic Defense Initiative, 1985.)

In the proposed SDIO budget for FY 1986, the Surveillance, Acquisition, Tracking and Kill Assessment (SATKA) program represents almost 40 percent of the total program, and work in weapons related areas is about evenly divided between directed and kinetic energy technology. This brings up an important point--to support future decisions on defensive options, diverse efforts preducing essential answers to critical issues must converge. The SDIO must bring along the emerging technologies in a logical, timely way if it is to offer a high confidence basis for decisions to pursue one or more defensive options.

QUESTION: One of the goals of SDI should be as a hedge if the Soviets did break out of the ABM Treaty and did begin deploying a missile defense system. The terminal defense project under SDI in the Kinetic Energy Weapons Program--which is called HEDI for High Endoatmospheric Defense Interceptor--would likely be our hedge against a Soviet breakout of the ABM Treaty. But that project is researching high-altitude non-nuclear interceptors for the terminal phase. Is this type of research really the best hedge against a Soviet breakout of the ABM treaty? Critics of SDI have said that research into conventional ballistic missile defenses has been downgraded under SDI, and this has had an adverse effect on SDI serving as a hedge against a Soviet breakout of the ABM Treaty. Would you comment on this?

ANSWER: The U.S. has a wide range of options both as initiative action and as response to Soviet initiatives. Some involve the considerable impact that the SDI program can have even while fulfilling its principal objective. The SDI research program has, as its main goal, the task of bringing along promising technologies so that decisions can be made on the possible development and deployment of appropriate defense systems, but it can also serve these other important goals. One is to ensure that the U.S. understands these technologies well enough to assess what the Soviets are doing and what level of maturity Soviet technology is reaching. Another is to contribute to peace through security even in the research phase by supporting the arms control process with knowledge of what is achievable. Still another is to offer the U.S. an option for equivalence in the event the Soviets decide to develop and deploy defenses beyond the provisions of the ABM Treaty.

The SDI research program is not at a point of developing systems but is investigating all promising technologies. In the perspective of the SDIO there is no conventional ballistic missile defense, but a number of concepts at varying degrees of maturity. These are being investigated in a systematic way without dwelling on many preconceived notions that might otherwise freeze prematurely on a design. In the view of the experts, this procedure has the best opportunity to advance these technologies toward an effective defense and still provide the first opportunity for an effective response to Soviet moves. Given adequate funding, these parallel efforts can be brought along at about the pace that they can bear. This organized concerted effort should have a beneficial impact on the treaty and arms control processes, including as a hedge against Soviet initiatives.

The High Endoatmospheric Defense Interceptor (HEDI) involves one of several technologies that offer a near-term hedge against potential Soviet breakout of the ABM Treaty. To say that ballistic missile defenses, such as HEDI, have been downgraded under SDI is untrue and misleading. The comment may be a reflection on the consequences of Congressionally directed funding reductions. In the "Report to Congress on Implementation of Congressional Reductions to the FY 1985 SDI Program Budget," submitted by Secretary Weinberger in February of this year, it states:

> "In our allocation of the budget cuts to the SDI program, we applied an overall strategy to maintain as best as possible (original) program goals, time lines, and tasks ... Since FY 1985 is the first year of the Initiative, we were able to minimize program delays by slipping new starts on a month-by-month schedule. In making these adjustments we were cognizant of the fact that slipping efforts completely into the next fiscal year is often unwise, because potential continuing resolution constraints and the normal contracting process could add several months of additional delay. Reallocation difficulties were exacerbated by the fact that the FY 1985 reductions were significant (21%). We were reluctant to cut back those programs which are not only a necessary

part of the SDI, but also are required for other programs ..."

The High Endoatmospheric Defense System was subject to a reduction as Secretary Weinberger's report showed but not prejudicial to that program. Other cuts, as his report showed, were deeper and may have a greater impact if funding is not sustained for them.

QUESTION: There seems to be a widespread feeling in the technical community, even among SDI supporters, that the High Frontier concept of space-based kinetic kill vehicles has all the problems of space-based chemical lasers and even more because it would take longer for the rocket projectiles to reach their targets. Yet I see that the funding level for space-based kinetic kill vehicle research would increase under the Administration's proposal by almost 400% in FY86. Is such a huge increase wise at this point, considering all the problems associated with High Frontier?

ANSWER: Yes. The increased funding supports the initiation of a carefully conceived approach to resolving critical technical issues (the "problems" referred to in the question) associated with a kinetic energy, boost-phase intercept weapon. The so called "huge" increase initiates this search for facts on a schedule that is keyed to supporting the early 1990s decision on whether to proceed to development and deployment.

This project is one of the ten in the Kinetic Energy Weapon (KEW) program. It represents approximately 17% of the total request for KEW for FY 1986. The project provides for concept design, and technology development, test, and evaluation for a space-based KEW experiment. The precise purpose for the experiment is to validate the technical feasibility of conducting space-to-space experiments in a treaty compliant manner.

If the project is properly funded, it is expected that some critical technologies can be tested late in this decade and will be transitioned into development of the experiment which would be conducted in the early 1990s. At that time SDIO expects to answer, with high confidence, the question of whether an effective, survivable, and affordable system can be developed.

QUESTION: Gen. Daniel Graham claims that his High Frontier missile defense system of space-based kinetic kill vehicles can be deployed at a cost of $30-$40 billion with off-the-shelf technology and it would be 85% effective or more against Soviet missiles.

Do you concur with General Graham's claim? Can High Frontier be 85% or more effective and cost $30 or $40 billion? Or, is this pie-in-the-sky dreaming?

ANSWER: We can neither agree nor disagree with General Graham's claim. There are a number of published estimates that support the opinions of the individual authors about the status of technology and cost of deployed systems and their predicted effectiveness. We are unable at this point to verify these and prefer not to add to the speculations. Nevertheless, we believe technical optimism is both warranted and appropriate and supports pursuing a vigorous program.

Of course, the decision regarding deployment of a highly complex defense system against ballistic missiles is not based on a specific plateau of reasons. It can be made early in the research with large uncertainties in the confidence of achieving goals developed early in the process. Or it can be made at some later point with greater confidence. There is considerable latitude in what constitutes off-the-shelf technology. It does appear apparent in today's environment that today's technologies must be tested more adequately to minimize costly consequences and to discover how the various technologies are brought together competently.

The Fletcher Report recommended a course of action and SDIO is pursuing a program that is based on that recommendation. While we do not fault General Graham's speculation, SDIO has organized a program that we believe is prudent and more commensurate with an orderly progress to a decision regarding development and deployment of a defense. It will be a number of years before we can answer the questions of affordability and effectiveness with the accuracy expected by decision-makers in the Executive and Legislative branches.

QUESTION: The Nuclear-Driven Directed Energy project envisions space-based laser battle stations powered by nuclear explosions. Setting aside for the moment the technical feasibility of this system, can you imagine the American public ever accepting hundreds of nuclear bombs floating over them in space?

Or more importantly, can you ever conceive of the Soviet Union going along with having hundreds of U.S. nuclear bombs floating in space over their country?

ANSWER: While there are some activities, such as the nuclear-driven directed energy project, that derive the energy in the beam from a nuclear source, the SDI is focusing on nonnuclear technologies. No single concept is currently identified as the best or most appropriate. The long-term goal of the research program is a truly effective nonnuclear defense.

There are, however, several reasons for pursuing nuclear research at this time. One reason is that the nuclear-driven directed energy concepts, if feasible, may prove to be an effective defensive technology option. Seeking to establish feasibility and likely effectiveness of such concepts is a prudent hedge. Further, it is important to understand such concepts as a potential threat that an adversary may develop to suppress U.S. defenses since it is possible that Soviet ballistic missile defense systems of the future may utilize such nuclear technology. It is imperative to understand the technical feasibility and impact these weapons might have on our forces.

QUESTION: Let's look at the technical problems raised by some of these star wars projects. Under the Surveillance Program we have the Optical Surveillance Experiment which will be a demonstration project showing the technical feasibility of using optical sensors on an airborne platform. Setting aside for the moment the question of whether demonstrating this airborne optical system will bump up against the ABM Treaty, aren't there serious technical questions as to whether an airborne optical system is the best way to go. Wouldn't it be extremely vulnerable in a nuclear environment? Wouldn't pop up sensors be a more survivable alternative?

ANSWER: The question of survivability of all the elemental technologies in the SDIO program is of major concern. The research program being pursued by SDI includes a critical examination of survivability along with effectiveness. However, the trap of considering a single characteristic of a concept must be avoided, since strengths or weaknesses of a given concept are often revealed when that concept is compared to others. Airborne platforms are often perceived as being more vulnerable than pop-up systems under some circumstances. However, airborne platforms could possess offsetting technical advantages over pop-up systems. A studied answer seems to be that it is more effective and less costly to attempt to achieve a more survivable airborne platform than to achieve pop-up sensors with the required performance. Nonetheless, it is just such issues as this that we seek to answer.

The SDI research program into the airborne platform technique seeks to determine first the availability of high-confidence technologies for late midcourse and terminal phase detection, discrimination and designation in conjunction with ground-based sensors. Only one of the concerns is for the survivability of the airborne platform itself. Problems associated with optical sensors, whether they are on airborne platforms or pop-ups, must also be investigated. The survivability and effectiveness of this and other concepts will continue to be assessed throughout the duration of the research program.

QUESTIONS SUBMITTED BY SENATOR BYRD

QUESTION: Suppose that we are able to build and deploy a ballistic missile defense system that could shoot down 80 percent or 90 percent of the Soviet missiles if they attacked us. The other 10 percent or 20 percent could probably destroy our cities and industry and kill millions of Americans. Would a system like this strengthen our deterrence?

ANSWER: Deterrence can be significantly enhanced by effecive, although not perfect, defensive systems. An imperfect but effective defense can play havoc with carefully orchestrated attack plans required for a successful first strick against military targets--the only targets against which credible attacks can be launched. No enemy would consider attacking with a system he believed to only to 10 percent effective. At worst, defenses can crate uncertainty as to the likely success of an attack, and at best, deny attack objectives. Effective defenses can also create incentives to pursue major arms reductions.

QUESTION: As you envisage the schedule of the SDI as a research program, when do you think it will be possible for you to supply Congress with a rough estimate of the cost of a ballistic missile defense system? Would this cost estimate likely be total dollars, or dollars per year, or both?

ANSWER: Cost estimates of a potential ballistic missile defense system would be an important element in supporting the early 1990s decision point. By that time, promising concepts will be selected, systems level development will be defined, and a thorough examination of responsive offensive countermeasures will have been performed. The SDI research program seeks to provide options for the early 1990s decision point based on defense architectures that are affordable, survivable, and effective.

QUESTION: I understand that you have let a number of contracts to propose a so-called system architecture. Will this architecture, at the level of detail of your contractors' reports, provide enough information to enable you to estimate the total cost of developing and deploying a system?

ANSWER: Information provided by the Systems Architecture Studies will not enable one to estimate the "total cost of developing and deploying" a defensive system--such overall cost estimates are considered premature at this point. Phase I is intended as a creative effort to develop methodologies for defining alternate architectures and to identify key system trade-offs. Phase II is intended as an in-depth analysis of architectural concepts developed during Phase I. This will include assessing architectural attributes and deficiencies, identifying cost drivers, risk and schedule issues, development priorities, potential system vulnerabilities, overall system performance, and policy and economic implications should we decide to deploy a defensive system.

QUESTION: As you envisage a system architecture, do you expect that it will include a concept as to how the various elements of the system could be protected if the Soviets chose to attack the ballistic missile defense system before attacking targets in the United States?

ANSWER: Defensive architectures developed by SDI must be evaluated on, among other things, their ability to perform their mission in the face of determined attacks that attempt to saturate, exhaust, avoid and spoof them. The current menu, as well as future possibilities for technical and tactical approaches to satellite survivability, give us initial confidence that we will be able to handle determined defense suppression attacks against our ballistic missile defense system.

QUESTION: We have been hearing a lot about how SDI should protect our NATO allies as well as the United States. Do your contracts for system architecture include a requirement that the system protect Western Europe?

ANSWER: Yes, the System Architecture Studies include the investigation of defensive systems that protect Western Europe.

QUESTION: Secretary of Defense Weinberger has suggested that our NATO allies might participate in the SDI research. How could this be done? Would we contract with European companies to carry out the research in certain areas? Would we freely exchange technical information with our European allies? Who would pay the costs of research done in Europe?

ANSWER: In the period since President Reagan introduced his vision for the Strategic Defense Initiative, many of our Allies have informally inquired about the prospects of their participation in the SDI research program. We used the opportunity of the NATO Defense Ministerial meeting in Luxembourg to extend a formal invitation to our friends to join with the U.S. in the SDI research program. In addition to the NATO countries, we are inviting Japan, Israel and Australia, and there may be others in the future. We have told our Allies that the U.S. is interested in exploring opportunities for cooperative research, consistent with our existing international obligations including the 1972 ABM

Treaty. We expect to initiate discussions on a bilateral basis in response to the interested countries.

As to how cooperative research would be implemented, it may prove beneficial to exchange some very special and qualified people, or to include them on U.S. research teams. For countries with unique capabilities and teams of technical people we may find it best to ask for help in solving a specific problem. For many projects we can open up the bidding process to allow Allied as well as U.S. firms to compete. Finally, in some selected areas of mutual interest, we may set up U.S. and Allied research in a company-to-company or joint laboratory effort. In sum, there are several options which can be tailored to best suit the mutual objectives of the U.S. and interested Allies.

Allied contributions would not be a precondition or a quota for technical cooperation. We need our best minds working on this difficult problem no matter where they can be found amongst our Allied countries. We would, of course, be pleased if any nation felt they could supplement U.S. funding with their own. Obviously, that would allow us a more vigorous cooperative effort, while increasing our mutual benefits and decreasing the time required in the research phase.

QUESTION: The President has said that during the early stages of SDI research we will be careful not to violate the provisions of the 1972 ABM Treaty. Is there some arrangement whereby an organization or an expert group who do not have a stake in carrying out particular experiments can advise the Administration about whether a given experiment is consistent with the treaty? If not, what do you think of creating such a review and making its findings available to Congress?

ANSWER: DoD has in place an effective compliance process (established in 1972 after the signing of the SALT I agreements), under which key offices in DoD are responsible for overseeing and will continue to oversee SDI compliance with all existing strategic arms control agreements. Under this process the SDIO, the relevant Agencies and Services ensure that the implementing program offices adhere to DoD Compliance and Directives and guidelines.

Specific responsibilities are assigned by DoD Directive 5100.70, 9 January 1973, Implementation of SAL Agreements. The Under Secretary of Defense for Research and Engineering (USDRE) ensures that all DoD programs, are in compliance with existing SAL agreements. The Service Secretaries, Chairman JCS and Agency Directors ensure the internal compliance of their organizations. The DoD General Counsel provides advice and assistance with respect to the implementation of the compliance process and interpretation of SAL agreements.

DoD Instruction S-5100.72 establishes general instructions, guidelines, and procedures for ensuring the continued compliance of all DoD programs with the existing agreements. Under these procedures, questions of interpretation of specific agreements are to be resolved on a case-by-case basis. No project or program which reasonably raises an issue as to compliance can enter into the testing, prototype construction, or deployment phases without prior clearance from the USDRE. If such a compliance issue is in doubt, USDRE approval shall be sought. In conjunction with the DoD General Counsel, the USDRE applies the provisions of the agreements, as appropriate. Military departments and DoD Agencies are to certify internal compliance quarterly and establish internal procedures and offices to monitor and ensure internal compliance.

As a new agency, SDIO was instructed to submit quarterly reports certifying its compliance and to monitor its projects, as required of other DoD Agencies. The Services are to ensure that SDI projects under their auspices are monitored and implemented in a Treaty compatible manner. They are to include SDI compliance in the quarterly reports they submit under DODI S-5100.72. Thus, there is already in place a carefully defined process, incorporating both the Executive and Legislative Branches, with over a decade of experience and practice in evaluating compliance. We believe adding yet another organization and review to the process as some have suggested would not be a good use of government resourses.

QUESTION: According to present plans, at what point would the U.S. have to choose between slowing down our research plans and violating the ABM Treaty? How will Congress be involved in this choice?

ANSWER: The Congress and the Executive Branch will not have to face such a choice. The SDI research program will provide to a future President and a future Congress the technical knowledge required to support a decision on whether to develop and later deploy advanced defensive systems. At the end of this research phase, if a decision is made to proceed to development and deployment of a ballistic missile defense beyond the scope of the defenses now permitted in the ABM Treaty, we would have to undertake negotiations to change the existing Treaty.

QUESTION: In your opinion, will the U.S. be ale to learn enough from the SDI research program to support a decision as to whether to deploy a ballistic missile defense system before we violate the provisions of the ABM Treaty?

ANSWER: Yes. The SDI research program is being conducted in a manner fully consistent with all U.S. Treaty obligations. Specifically, a review of the SDI program has found that the research necessary to support a decision on the potential utility of the SDI technology can be conducted in accordance with U.S. Treaty obligations.

QUESTION: For each of the major technologies that the SDI is investigating, please give your assessment as to whether we are ahead or the Soviets are ahead.

ANSWER:

DIRECTED ENERGY: In those areas which the US has chosen to pursue for SDI purposes there is rough equality, overall, in the basic level of technology. However, there are other technologies such as certain types of lasers which could have an ABM role in which there is a Soviet lead. It should be noted that larger Soviet efforts over the last twenty years have given them a lead in the integration of laser technologies

BEST COPY

into weapons devices. In this regard the first operating high energy laser weapons for missions such as air defense are likely to be Soviet.

KINETIC ENERGY: There is a US lead in Hit-to-kill technologies and rough comparability in electromagnetic launchers. Again the Soviets have a commitment to programs for early weaponization and have produced an operational kinetic energy ASAT.

SURVEILLANCE, ACQUISITION, TRACKING, AND KILL ASSESSMENT:

The US is believed to lead in development of optical (and infrared) sensors. Both the US and Soviets each lead in some aspects of radar technology however, the Soviets have a much larger industry.

BATTLE MANAGEMENT AND C^3: In the key technology of computers the US holds a substantial lead in electronic computers. The Soviets, however, have a strong program in optical computers which could have the potential to give them an advantage for some SDI related tasks by the end of the 1990s.

SUPPORT: The category comprises a wide variety of technologies. In some areas such as space power there is a Soviet lead. In other important areas such as the ability to maintain systems in orbit, there is a US lead. There is probably rough equality in the ability to build heavy lift vehicles for space launch.

It should be remarked that in pursuing SDI missions technological strengths in some areas can offset weaknesses in others. Additionally, both the Soviet Union and the US can be expected to design systems which make optional use of their respective technological advantages. Degree of Commitment is also a major factor. In this regard we believe the Soviets have, in the past, had a larger and steadier commitment toward developing ABM systems.

QUESTION: At the time of the President's March 23, 1983 speech, the Army was working on systems to defend ICBM silos. Has work progressed on those systems since the SDI was set up?

ANSWER: Although work on systems that could protect ICBM silos has progressed, a shift in emphasis has occurred since the formation of the SDI. This shift has been from low altitude intercept with nuclear warheads to high altitude nonnuclear intercept to permit wider application of terminal defenses (e.g. defense of softer targets where a low altitude burst of the incoming warhead through salvage fuzing could damage the defended target. Many of the basic technologies pursued by the Army are still under investigation, but system level focus has shifted from the Low Altitude Defense System (LoADS) to the High Endoatmospheric Defense Interceptor/Exoatmospheric Reentry Interceptor Experiment (HEDI/ERIS), which would also be able to defend silos. Further, a multi-tiered defense deployed to perform multiple missions could provide an excellent defense of silos with a greater margin against attempts to exhaust or saturate the terminal defenses.

QUESTION: Suppose that tomorrow morning the Soviets announced that they were withdrawing from the ABM Treaty and deploying a nationwide ABM defense. How soon could the U.S. deploy an ABM of our own? What would it defend?

ANSWER: In the near term, considering the state of existing technologies, it is not certain that an immediate deployment of a U.S. defensive system would be an appropriate response. However, the SDI program is working on a range of technologies, some of which could be available in the mid-1990s. These technologies, as is the case with all SDI technologies, would be to defend against all ballistic missiles, regardless of their target.

SUBCOMMITTEE RECESS

Senator McClure. The subcommittee will adjourn until 10 a.m., Thursday, when it will hear testimony on the Air Force tactical aircraft program. Thank you.

[Whereupon, at 12:25 p.m., Tuesday, April 23, the subcommittee was recessed, to reconvene at 10 a.m., Thursday, April 25, 1985.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

THURSDAY, APRIL 25, 1985

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 10 a.m., in room SD-192, Dirksen Senate Office Building, Hon. Ted Stevens (chairman), presiding.

Present: Senators Stevens, D'Amato, Rudman, Proxmire, Chiles, and Sasser.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE AIR FORCE

STATEMENT OF THE HONORABLE THOMAS E. COOPER, ASSISTANT SECRETARY OF THE AIR FORCE FOR RESEARCH, DEVELOPMENT AND LOGISTICS

ACCOMPANIED BY:

LT. GEN. ROBERT D. RUSS, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION, UNITED STATES AIR FORCE

MAJ. GEN. GEORGE L. MONAHAN, JR., DIRECTOR OF DEVELOPMENT AND PRODUCTION, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

BRIG. GEN. JIMMIE V. ADAMS, SPECIAL ASSISTANT FOR TACTICAL MODERNIZATION, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

AIRCRAFT PROCUREMENT AND RDT&E

OPENING STATEMENT OF SENATOR STEVENS

Senator STEVENS. Good morning.

We are here today to discuss the fiscal year 1986 request for Air Force aircraft procurement and related R&D. The aircraft procurement request of $26.2 billion is about one-fourth of the total Defense Department procurement budget.

While the request is only $88 million higher than the 1985 appropriated level, this is a distortion caused by a $1.6 billion decrease in B-1 funding reflecting the last of the 100 aircraft multiyear buy.

Almost three-fourths of the aircraft procurement budget is dedicated to four major programs—the B-1, tactical fighters, C-5B and spare parts. We will focus today on these programs as well as ongoing aircraft production, and an examination of force structure objectives.

In addition, we plan to explore some of the long-term program implications resulting from the Air Force research and development programs.

INTRODUCTION OF WITNESSES

Our principal witness is Dr. Thomas E. Cooper, Assistant Secretary of the Air Force for Research, Development and Logistics.

We will also be hearing from Lt. Gen. Robert D. Russ, the Deputy Chief of Staff for Research, Development and Acquisition.

It is a pleasure to have you both here today. Your full statement will be incorporated in the record, so we ask that you summarize your prepared remarks.

General Russ, I understand you have planned a brief slide presentation on the procurement program. Gentlemen, in order for the committee members to fully benefit from your expertise through their questions, I ask that your presentation be kept within 15 minutes.

I will ask my friend from Wisconsin if he has an opening statement?

Senator **PROXMIRE**. No opening statement Mr. Chairman.

Senator **STEVENS**. Any other Senators have comments?

Senator **RUDMAN**. No, thank you, Mr. Chairman.

Senator **STEVENS**. You may proceed then, Mr. Secretary.

DR. COOPER'S OPENING REMARKS

Dr. **COOPER**. Thank you, Mr. Chairman and members of the committee.

It is a pleasure for General Russ and I to be here this morning to discuss our aircraft procurement and RDT&E programs that relate to our aircraft programs.

I am going to dispense with any formal opening remarks. I know you want us to keep our formal presentation short.

INTRODUCTION OF ASSOCIATES

General Russ is going to give you an overview of that portion of the budget that we will try to set in context.

He will be followed by Brig. Gen. Jimmie Adams who is our special assistant for tactical aircraft modernization. He is going to cover only items that we know are of special interest to the committee including an update of our Tactical Fighter Roadmap and he will also give you a status report on, among other things, the progress of our engine development programs.

Those are two items that have been of particular interest to this committee.

In addition, we have another expert in the booth, that is Maj. Gen. George Monahan, Director of Development and Production, who works directly for General Russ. He will assist us in responding to the committee's questions.

Mr. Chairman, I will just turn this over to General Russ who will give you a very brief overview of our aircraft procurement and RDT&E programs.

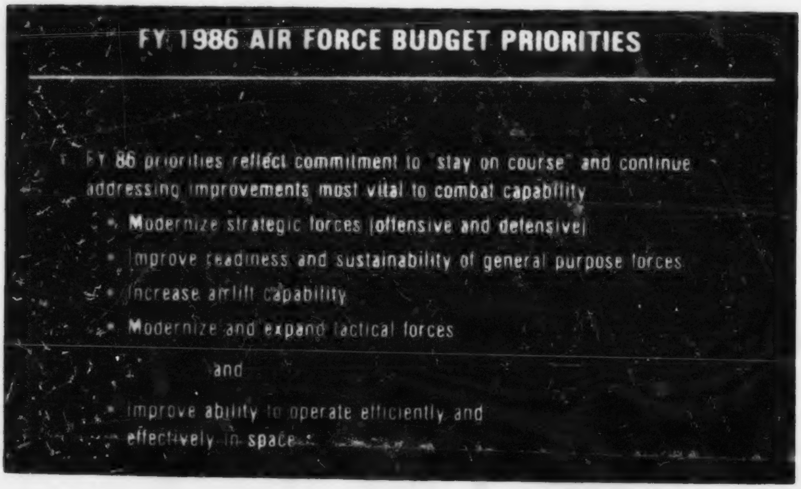
Senator **STEVENS**. Thank you.

General?

GENERAL RUSS OVERVIEW

General RUSS. Mr. Chairman, I am glad to be back in front of the committee.

As Dr. Cooper said, I will give you a short overview to put the aircraft procurement and RDT&E accounts into perspective.



FY 1986 AIR FORCE BUDGET PRIORITIES

- FY 86 priorities reflect commitment to "stay on course" and continue addressing improvements most vital to combat capability
  - Modernize strategic forces (offensive and defensive)
  - Improve readiness and sustainability of general purpose forces
  - Increase airlift capability
  - Modernize and expand tactical forces

and

  - Improve ability to operate efficiently and effectively in space

SLIDE 1

BUDGET PRIORITIES AND DEVELOPMENT

General RUSS. First, it is useful to look at how we develop the budget. Our 1986 budget priorities are shown on this slide. In other words, these are the priorities we use in developing our budget. They reflect the commitment to stay on the course we have briefed the committee on last year.

First was to modernize our strategic forces, then to improve the readiness and sustainability of our general purpose forces; next to increase our airlift capability followed by efforts to modernize and expand our tactical forces; and last to improve our ability to operate efficiently and effectively in space.

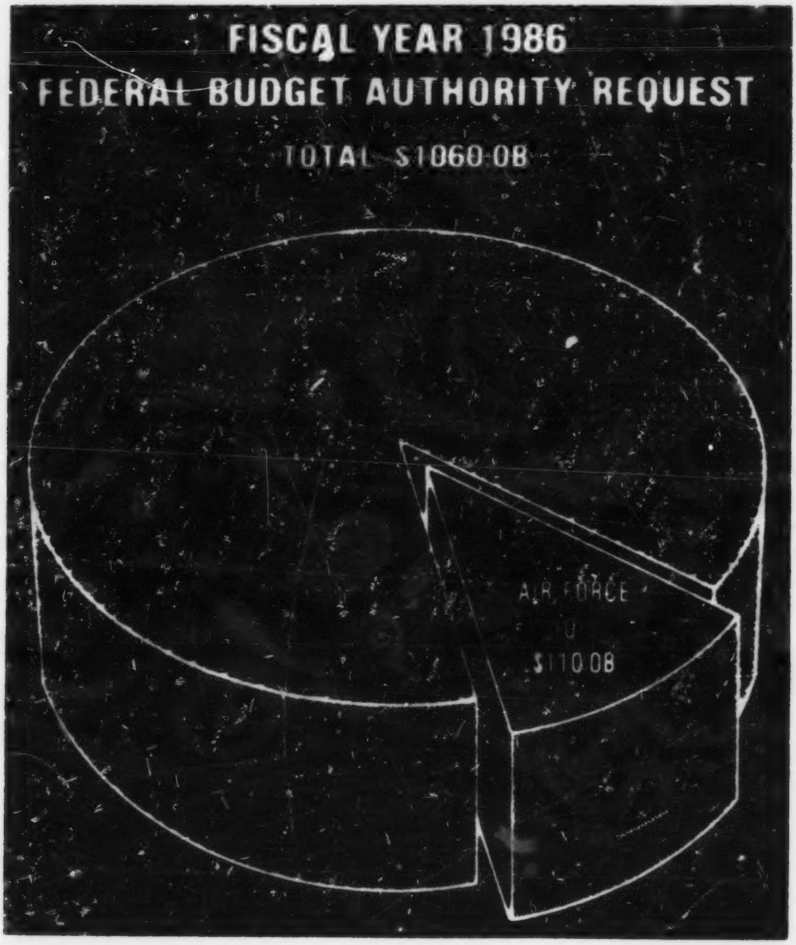
However, I would be remiss if I didn't raise the people issue, because overriding all of these priorities is the job that we must do to take care of our people.

Now, these priorities were used in apportioning the Air Force budget request which is $110 billion.

Dr. COOPER. In your opening statement you asked us to put into context where we were going long term, what our goals are. This is really the template we have used for the last 5 years in formulating our budget.

Those priorities have remained constant and I believe will remain constant over the next several years. So, as our budget fluctuates, goes up and goes down, we try to make the adjustments in balance with this list of priorities.

So, to get back to your question, for later in the hearing, this is where I would direct your attention on those five Air Force priorities.

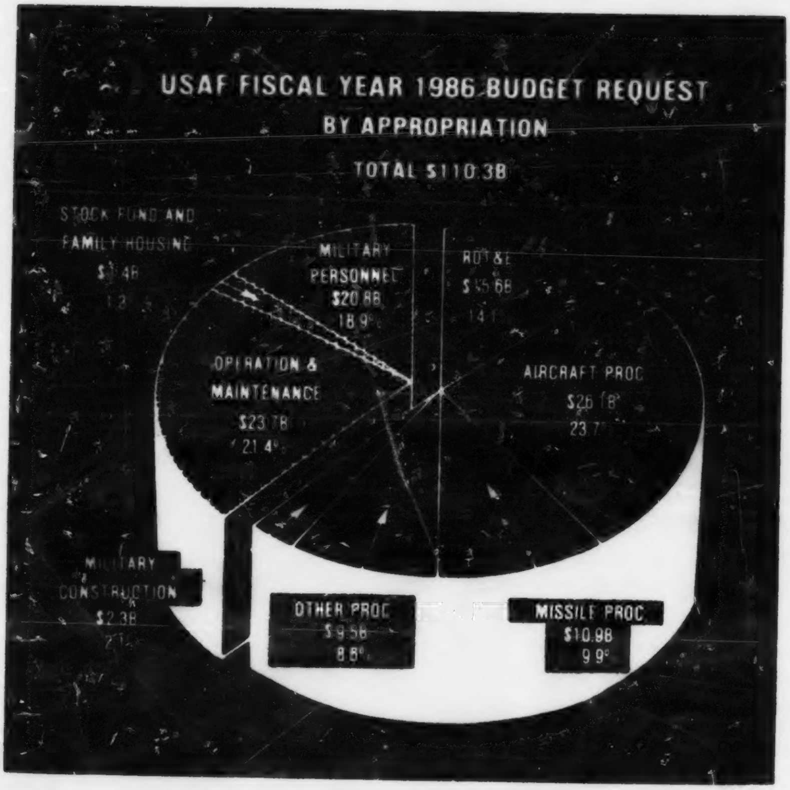


FISCAL YEAR 1986
FEDERAL BUDGET AUTHORITY REQUEST
TOTAL $1060.0B

Slide 2

AIR FORCE BUDGET

General Russ. The current Air Force budget is 10 percent of the total Federal budget request and is $110.0 billion in budget authority. As you know, that $110.0 billion in budget authority equates to $120.3 billion in TOA.



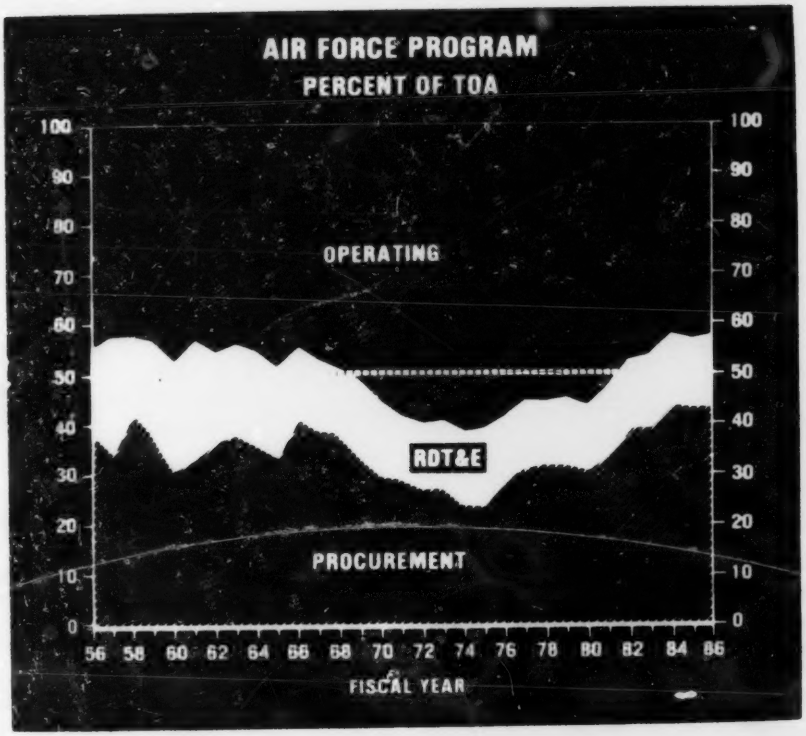
USAF FISCAL YEAR 1986 BUDGET REQUEST
BY APPROPRIATION
TOTAL $110.3B

Slide

REAL GROWTH

General Russ. The $110.3 billion represents a 5.8-percent real growth over the fiscal year 1985 appropriations. The request is divided into the appropriation accounts shown on this slide. The checkered area includes the operating accounts and represents approximately 42 percent of the budget. Investment accounts, which include the RDT&E, procurement and Milcon, represent 58 percent of the budget.

Before we discuss the aircraft procurement account and associated R&D, I thought it would be useful to look at the balance between the operating accounts and investment accounts.



SLIDE 5

INVESTMENT VERSUS OPERATIONS

General RUSS. This chart shows the percentage of our money that goes into the operating accounts and the percent that goes into the investment accounts over time. The top part of the chart is the operating accounts and the bottom part of the chart, which includes RDT&E and procurement, is the investment accounts.

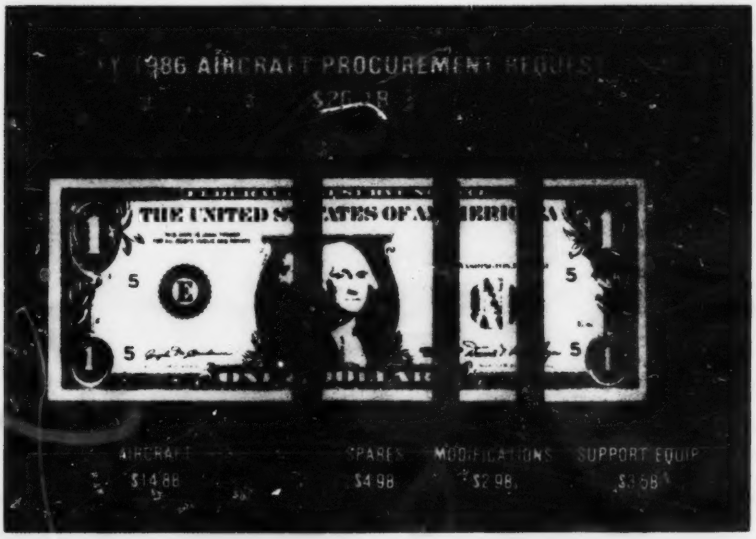
HISTORICAL PERSPECTIVE

In the decade between the mid-1950's and mid-1960's approximately 55 percent went to the investment accounts. From 1966 to 1980 the balance shifted and 55 percent went to the operating accounts. The balance again shifted from fiscal year 1980 to fiscal year 1986 and we are now back to 55 percent in the investment accounts.

We consider this sine wave pattern normal. There is no exact percentage we should spend in the operating or investment account. If you ran a historical average back over the past 30 years you would find it is exactly 50 percent. We see that as about right

We don't sit down and make a conscious effort to split the accounts. What we do is give the operating accounts priority as we develop the budget.

Let me turn now to the specific aircraft procurement accounts.



FY 1986 AIRCRAFT PROCUREMENT REQUEST

$26.1B

AIRCRAFT $14.8B

SPARES $4.9B

MODIFICATIONS $2.9B

SUPPORT EQUIP $3.5B

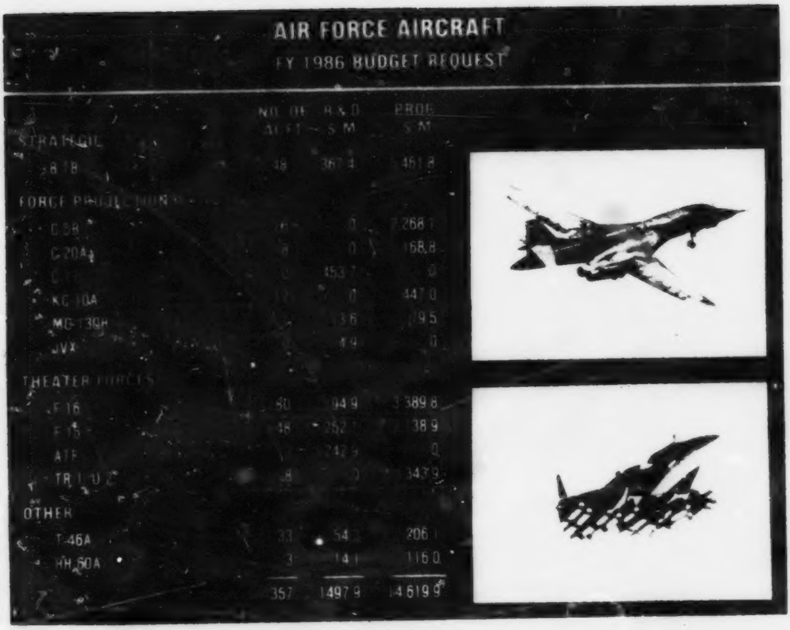
THE UNITED STATES OF AMERICA
1
5
E
ONE DOLLAR

Slide 5

AIRCRAFT PROCUREMENT

General Russ. The aircraft procurement account represents 56 percent of the total procurement. It is broken down into the four areas shown on this slide, aircraft, $14.8 billion; aircraft spares and repair parts, $4.9 billion; modification of in-service aircraft, $2.9 billion; and support equipment and facilities, $3.5 billion.

Now, the $14.8 billion in aircraft procurement buys 357 airplanes that are shown on this slide.



AIR FORCE AIRCRAFT

FY 1986 BUDGET REQUEST

	NO. OF ACFT	R&D $M	PROC $M
STRATEGIC			
B-1B	48	367.4	451.8
FORCE PROJECTION			
C-5B	16	0	2,268.1
C-20A	8	0	168.8
C-17	0	453.7	0
KC-10A	12	0	447.0
MC-130H	[illegible]	13.6	179.5
JVX	0	4.9	0
THEATER FORCES			
F-16	180	94.9	3,389.8
F-15	48	252.1	[illegible]38.9
ATF	[illegible]	242.9	0
TR-1/U-2	8	0	343.9
OTHER			
T-46A	33	54.[illegible]	206.1
HH-60A	3	14.1	116.0
	357	1497.9	14,619.9

SLIDE 6

B-1

General Russ. In the strategic area, as you mentioned in your opening remarks, Mr. Chairman, we are procuring 48 B-1's this year and that is the last of the B-1 buy. There is no money in 1987 for any more B-1's.

C-5

In the force projection area we are requesting money to buy 16 C-5B's. As you know, the total buy is 50. Next year we will request 21 and that will terminate the C-5B procurement.

C-20

In the C-20 line, we are requesting eight this year. Originally we planned on requesting three. However, we saw the opportunity to save approximately $50 million by buying the C-20's out and then shutting down the line. Therefore, that is what we have done.

C-17

In the C-17 line, we had a recent DSARC decision to start our full-scale development. The objective is to procure some 210 C-17's. This year we are asking a little over $450 million to proceed with that.

KC-10

The KC-10 buy this year is twelve. Next year it is eight and then that will terminate the KC-10 buy. As you know, we are on a multiyear procurement for that aircraft. It started in fiscal year 1982, it runs through fiscal year 1987 and it buys a total of 44 aircraft. That is 44 combined with the 16 we had before which fills out our force of 60 KC-10's.

MC-130H

The MC-130H is our special operations aircraft. While it says one aircraft, there are two aircraft. We are buying one aircraft new, and we are modifying one aircraft so that we will effectively have two aircraft in that line.

JVX

The JVX is the follow-on aircraft that the Navy is procuring. The small amount of R&D is for peculiar Air Force support items that will be going into the aircraft.

F-16

In the theater forces area, the largest procurement in the budget, the large number of airplanes are fighters. I should also say we are continuing with the multiyear approved last year for the F-16, and we are requesting 180 aircraft. That was a 4-year multi-year for a total of 720 aircraft.

F-15

In the F-15 line 48 aircraft are composed of 40 C and D models and 8 E models. This is the last year we will be buying C and D models. The C and D line will shut down after 1986.

ATF

In the Advanced Tactical Fighter, or the ATF, we are starting that program or actually we started it 2 years ago. That money is primarily for development of engines and some for airframes. But the vast majority, approximately $150 million, is for engine development.

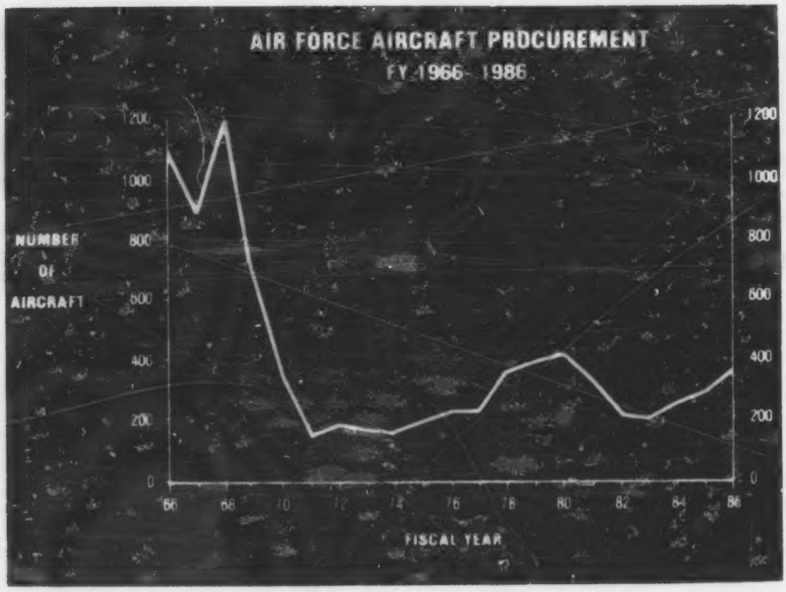
TR-1/U-2/T-46

In the TR-1 and U-2 line we are procuring eight this year. In fiscal year 1985 we bought 10 T-46 trainers and in the fiscal year 1986 request we are asking for 33. That program is proceeding well at this time.

HH-60

The HH-60A request is initial procurement of the helicopter which is the same helicopter, I should say derivative of the Army Blackhawk helicopter.

Those 357 airplanes are 71 more than we received in the fiscal year 1985 budget.



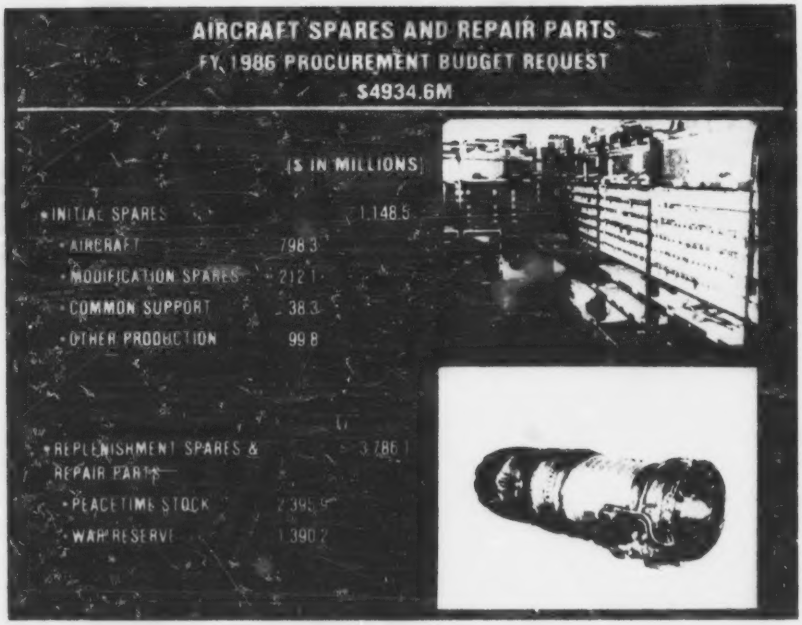
Slide 7

THIRTY-YEAR PROCUREMENT OF AIRCRAFT

General Russ. This slide shows our aircraft procurement over the last 30 years. You can see the very high procurement levels back during the Vietnam conflict. We hit an all-time low in 1971 when we dropped to about 149 aircraft. It was varied up and down from that time and this year, like I said, we are asking for 357 airplanes. Of that 357, the vast majority, or some 228 aircraft, are fighter aircraft.

General Adams will show you a chart on that a little later on.

Now, the second part of the aircraft procurement account is for aircraft spares.



AIRCRAFT SPARES AND REPAIR PARTS

FY 1986 PROCUREMENT BUDGET REQUEST

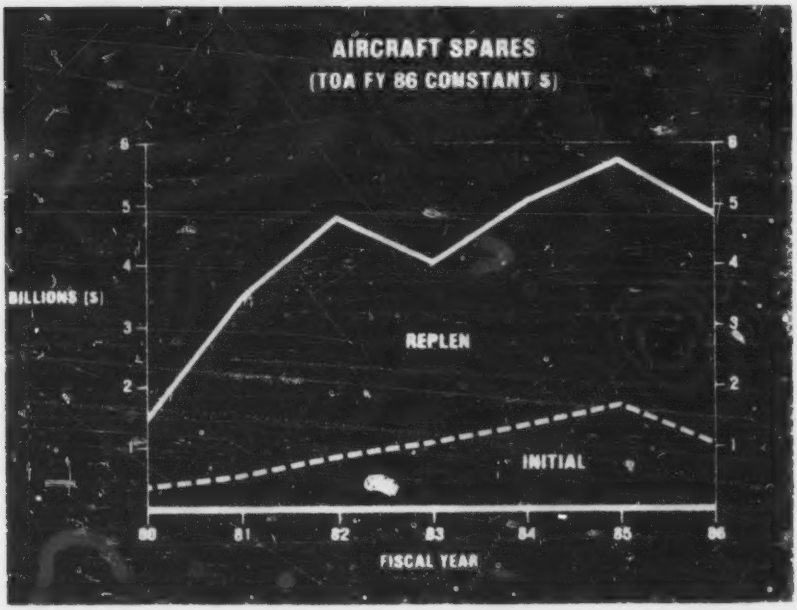
$4934.6M

($ IN MILLIONS)		
• INITIAL SPARES		1,148.5
• AIRCRAFT	798.3	
• MODIFICATION SPARES	212.1	
• COMMON SUPPORT	38.3	
• OTHER PRODUCTION	99.8	
• REPLENISHMENT SPARES & REPAIR PARTS		3,786.1
• PEACETIME STOCK	2,395.9	
• WAR RESERVE	1,390.2	

SLIDE 8

AIRCRAFT SPARES

General RUSS. The request is for $4.9 billion. $1.1 billion is for initial spares and $3.8 billion is for replenishment spares.



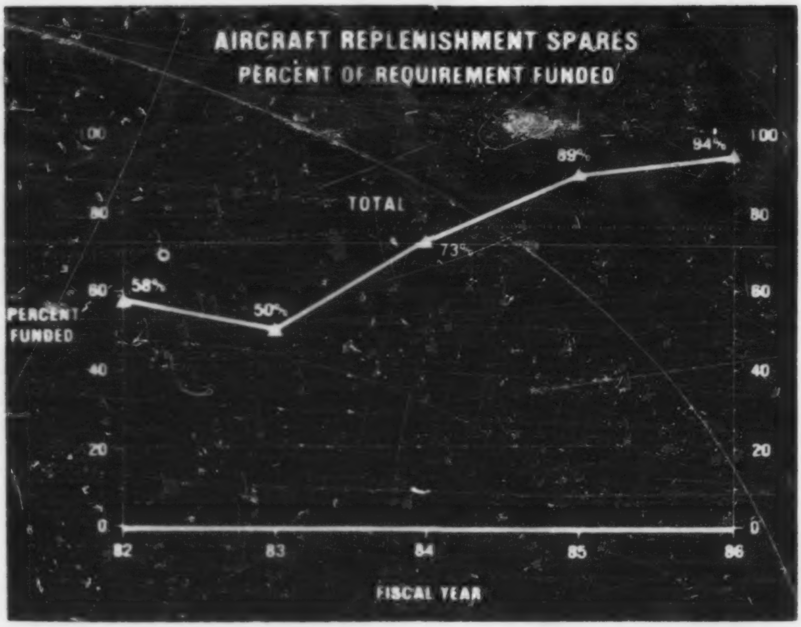
[illegible]

SPARES [illegible]

Secretary Rice. This chart shows [illegible]

[illegible]

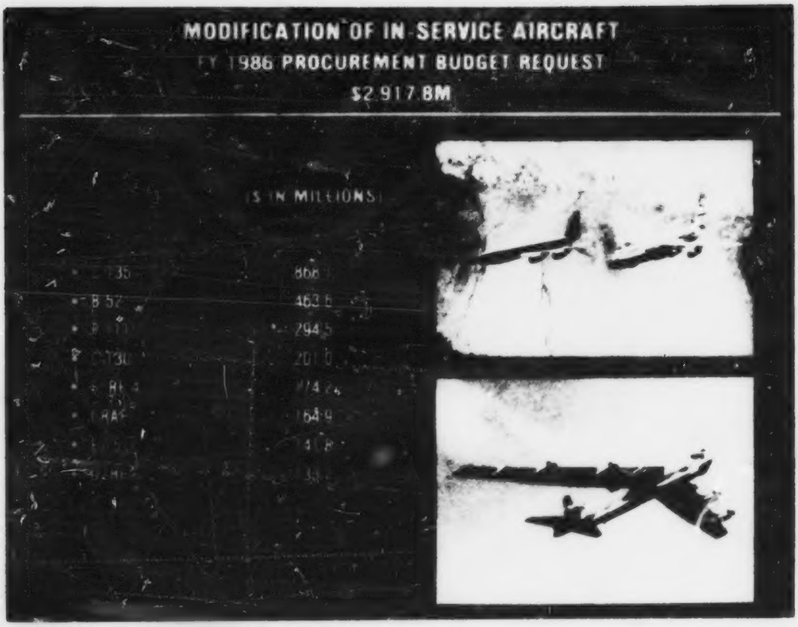
Secretary Rice. This slide [illegible] We have increased [illegible] as we emphasize our readiness [illegible] funding peaked out in 1985 and [illegible] billion level.



[Slide]

PERCENT FUNDED

General Ross. This slide shows what that funding did. With the fiscal year 1985 appropriation, we funded 89 percent of our requirement. With this year's request we funded 94 percent of the requirement. We were unable to fund the last 6 percent primarily because we weren't able to define that sufficiently to put it in the budget. Therefore, we chose not to fund the last 6 percent.



MODIFICATION OF IN-SERVICE AIRCRAFT
FY 1986 PROCUREMENT BUDGET REQUEST
$2,917.8M

($ IN MILLIONS)

• C-135	868.[illegible]
• B-52	463.6
• F-111	294.5
• C-130	201.0
• F-4	[illegible]
• CRAF	164.9
• [illegible]	[illegible]
• [illegible]	[illegible]

Slide [illegible]

AIRCRAFT MODIFICATIONS

General Russ. The third part of the aircraft procurement account is for the modification of in-service aircraft. The request this year is for $2.9 billion.

As you know, there are three types of modifications. Class V modifications which provide new capability in the aircraft, class IV associated with safety modifications and reliability and maintainability, and the third type is used to correct test-revealed deficiencies.

C-135/KC-135

The largest chunk is in the C-135 line and of that the largest portion is for the KC-135 reengining program for the strategic tankers. Forty-three tanker kits to modify 43 tankers are included in the almost $700 million request.

For the B-52, we plan to do some upgrades in ECM capability, and some modifications to carry the air-launched cruise missile. We also will do the F-111 avionics modernization program, and for the C-130's, we plan to do some outer wing modifications and other minor modifications.

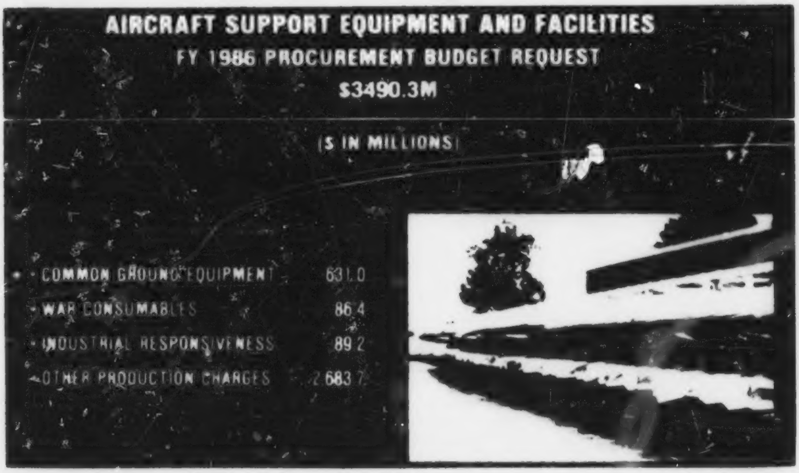
For the F-4 fleet, we plan to do some radar warning modifications and some other reliability mods.

CRAF

In the civil reserve air fleet program, this is the last five of our modified 747 buys. We bought these from Pan Am and this request will complete that program.

UPGRADES

Then we have a series of upgrades on our multistage improvement program for our F-15 in addition to a series of other mods that go across the fleet.



AIRCRAFT SUPPORT EQUIPMENT AND FACILITIES

FY 1986 PROCUREMENT BUDGET REQUEST

$3490.3M

($ IN MILLIONS)

• COMMON GROUND EQUIPMENT	631.0
• WAR CONSUMABLES	86.4
• INDUSTRIAL RESPONSIVENESS	89.2
• OTHER PRODUCTION CHARGES	2,683.7

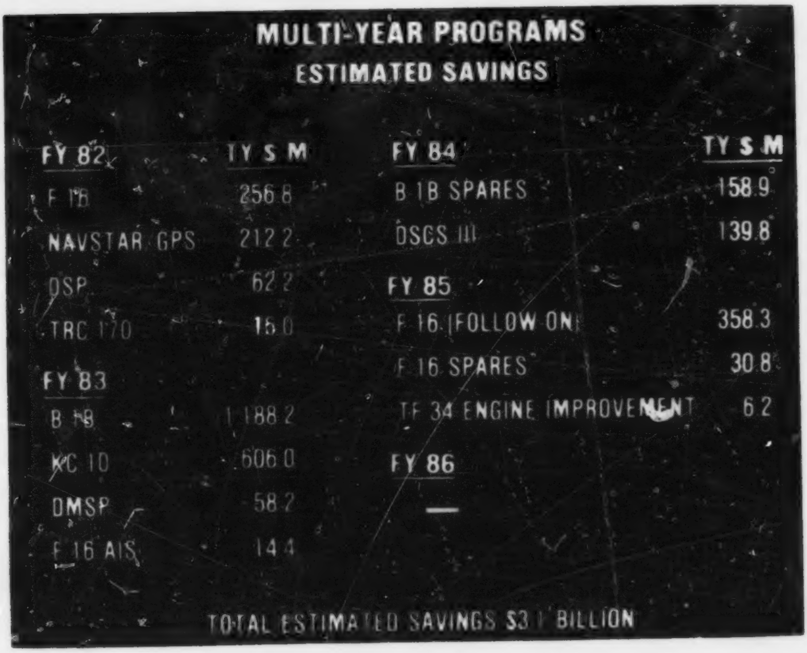
SLIDE 12

AIRCRAFT SUPPORT EQUIPMENT AND FACILITIES

General RUSS. The last part of the aircraft procurement account is for aircraft support equipment and facilities. The request is for $3.5 billion. The common support equipment line includes such things as aircraft deicers, noise suppressors, automatic test equipment and many other consumables including such things as fuel tanks and launchers, that are expendable primarily during combat.

OTHER PRODUCTION CHARGES

The largest portion in this budget is the other production charges and the largest item in that line, over $1.5 billion, is for classified programs.



MULTI-YEAR PROGRAMS
ESTIMATED SAVINGS

FY 82	TY $ M	FY 84	TY $ M
F 15	256.8	B 1B SPARES	158.9
NAVSTAR GPS	212.2	DSCS III	139.8
DSP	62.2	**FY 85**	
TRC 170	15.0	F 16 (FOLLOW ON)	358.3
FY 83		F 16 SPARES	30.8
B 1B	1,188.2	TF 34 ENGINE IMPROVEMENT	6.2
KC 10	606.0	**FY 86**	
DMSP	58.2	—	
F 16 AIS	14.4		

TOTAL ESTIMATED SAVINGS $3.1 BILLION

Slide [illegible]

MULTIYEAR PROCUREMENT

General RUSS. The last chart I have is on multiyear procurement. I thought it would be useful to show the committee what our track record is. You can see the various multiyear procurement efforts that we have had starting since 1982 with estimated savings over $3 billion.

We do not have any new multiyear procurement requests in this year's budget. We did not have any that we felt met the stringent criteria laid down by the committee, but we are looking for new efforts for 1987.

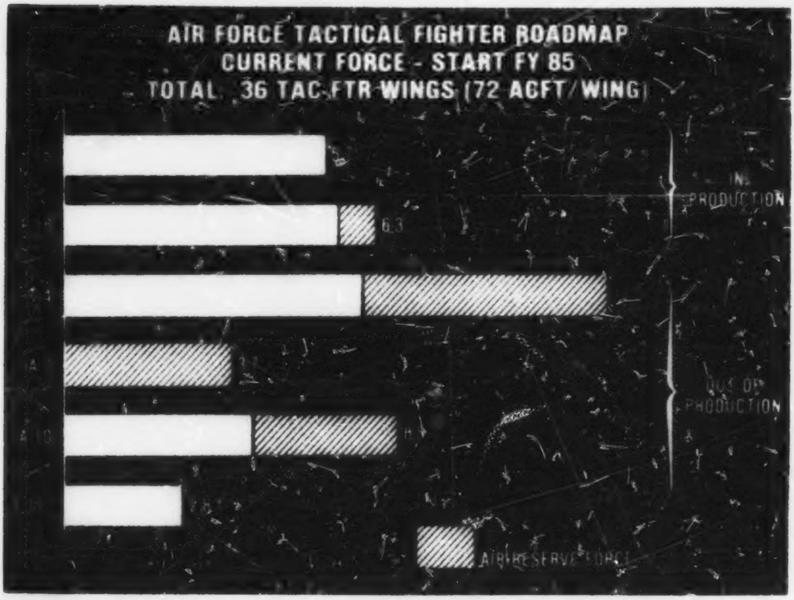
INTRODUCTION OF GENERAL ADAMS

With that, Mr. Chairman, I would like to turn it over to General Adams who has a few words on some of our fighter programs which compose the largest portion of our request for procurement in aircraft this year.

Senator STEVENS. General, we have a deadline here that I know because of services we have to attend. We have some serious questions. So, I hope you will keep it short.

TACTICAL FORCE STRATEGY

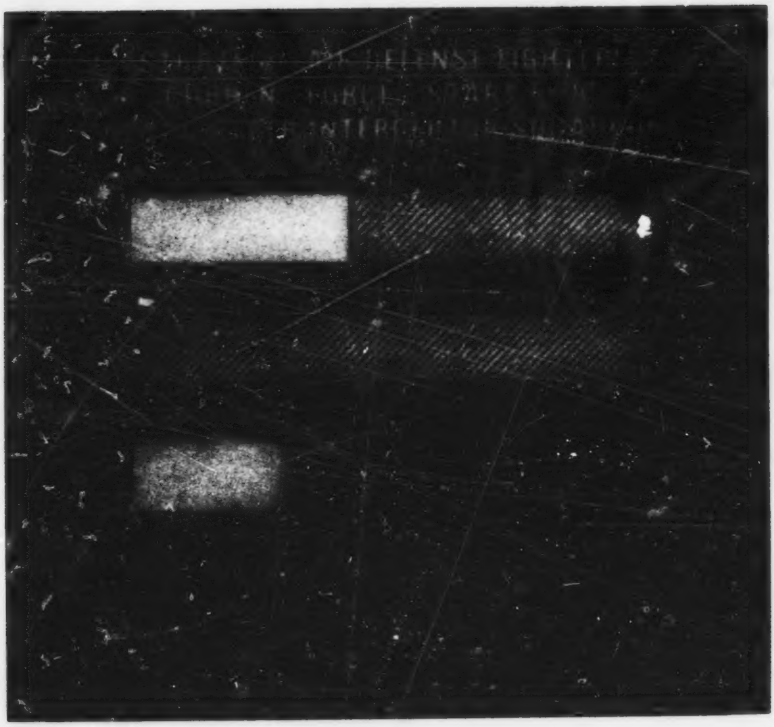
General ADAMS. Sir, I would like to cover two areas, updates to the fighter road map strategy presented last year and details of the various programs in which the staff indicated the committee has special interest.



Slide 14

FIGHTER ROAD MAP

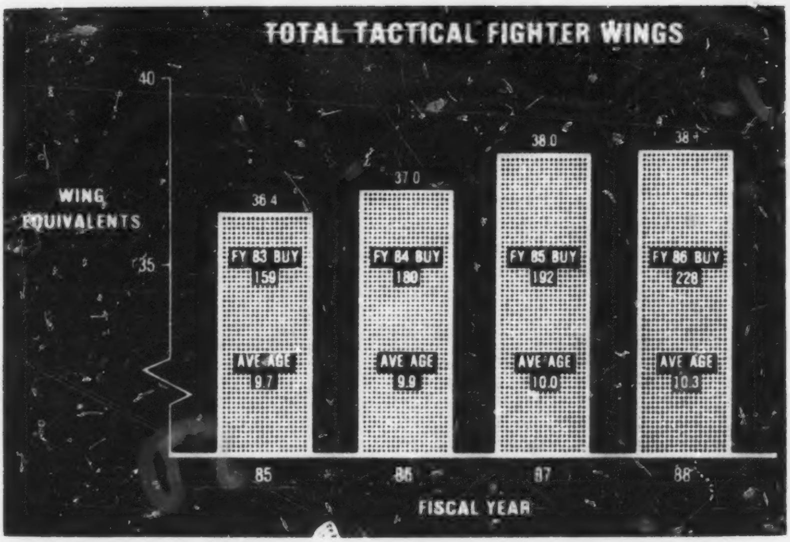
General ADAMS. This is our current tactical fighter force, 36 wings. A third of which are in the F-4 aircraft and about a third belong to the Air Force Reserve and Air National Guard as indicated in the green.



SLIDE 15

AIR DEFENSE

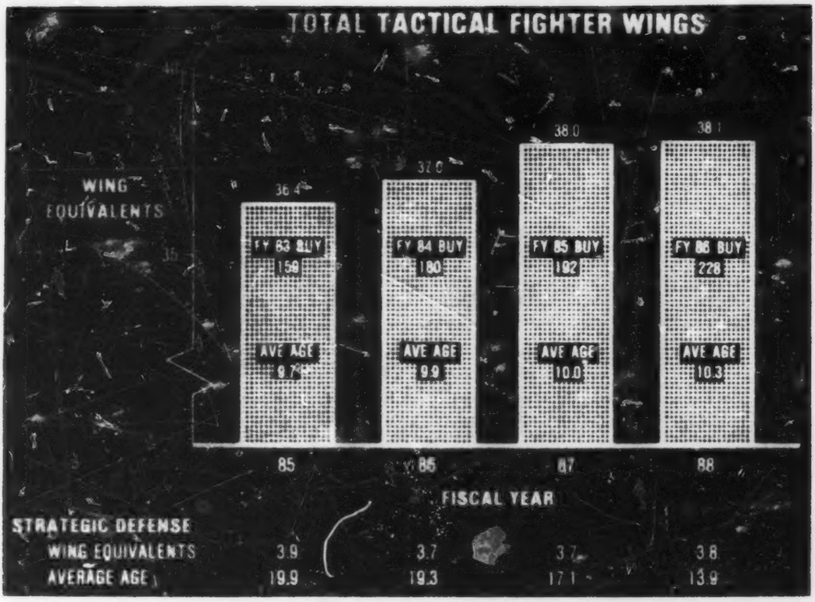
Only F-15's and F-16's are currently in production. In our continental air defense force we have 16 squadrons of 18 aircraft each. Two-thirds of those are manned by Air National Guard and are composed of the older F-106's and F-4's. We have begun modernization by converting two squadrons to F-15's.



SLIDE 2

TACTICAL FIGHTER WING GOAL

While our 40 tactical fighter wing goal has been somewhat elusive, we are making progress. This chart shows that at the end of this year we will be at 36.4 wings, and by 1987, which incorporates the 1985 buy of 192 aircraft, we do reach 38 tactical fighter wings.

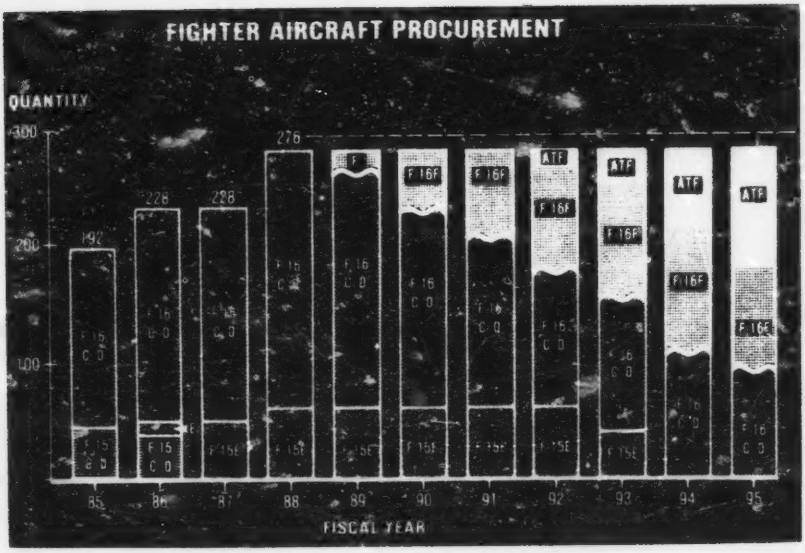


Slide 17

INCREASE IN AVERAGE AGE

We do that partly by increasing the average age by three-tenths of a year from fiscal year 1985 through fiscal year 1987. With our fiscal year 1986 buy we hold that at about 38 wings and continue to increase the average age of the fleet. However, at the same time in the strategic air defense area, we are modernizing so that the average age of that force decreases by about 3 years between fiscal year 1987 and fiscal year 1988.

We essentially hold the tactical force level constant while we are modernizing here in the air defense force.



SLIDE 18

PROCUREMENT STRATEGY

General ADAMS. This chart shows the procurement strategy. We showed this to the committee last year. There have been some modifications. We received approval for 192 aircraft in fiscal year 1985 and in fiscal year 1986 we are requesting a total of 228 fighters.

F-15

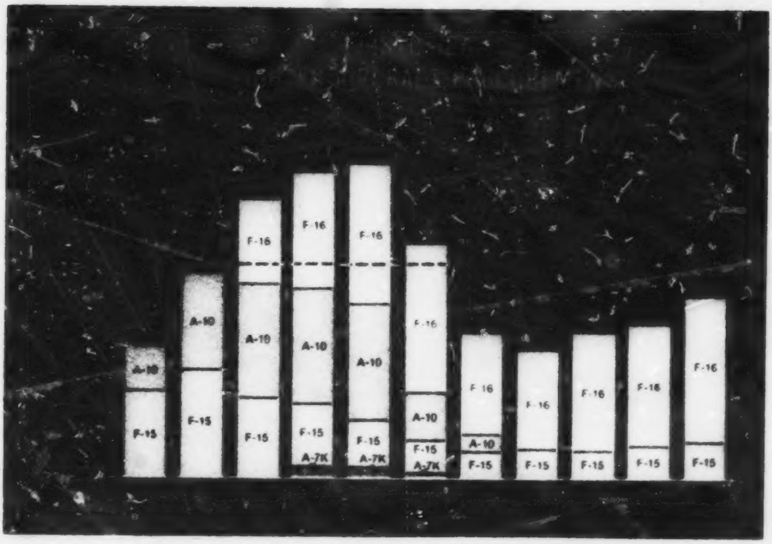
Forty-eight of the total are F-15's. Of these, 40 are the last C and D models and 8 are the new E model. Seven of these aircraft are test. We begin at 48 here and move up to 60 F-15's until we complete the buy in fiscal year 1993 for a total of 392 F-15E's.

F-16

In the F-16's, we look to move to 180 in fiscal year 1986 and fiscal year 1987, and then to 216 beginning in fiscal year 1988. Two hundred seventy-six is the number we discussed last year to allow us to move to 40 tactical fighter wings. We hope to get there by 1991. That allows us to keep an acceptable average age for our fleet.

F-16F ATF

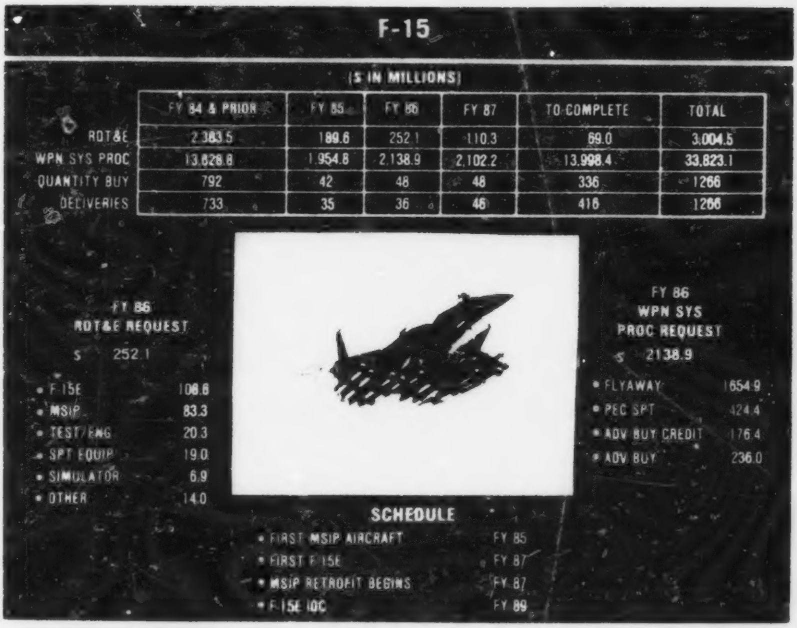
In fiscal year 1989 we look to provide for an evolutionary model change of the F-16's called to the F-16F to increase its range and payload. Then we bring on the Advanced Tactical Fighter in procurement year 1992.



SLIDE 19

10-YEAR RECORD OF F-15

General ADAMS. While it seems ambitious to get 276, this chart reminds us of where we have been in the last 10 years. For the last 10 years we have averaged a 252 fighter aircraft procurement per year and there are four of these years where we exceeded the 276. We are trying to get this ramped back up to an acceptable level for procurement.



F-15

(\$ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
RDT&E	2,383.5	189.6	252.1	110.3	69.0	3,004.5
WPN SYS PROC	13,628.8	1,954.8	2,138.9	2,102.2	13,998.4	33,823.1
QUANTITY BUY	792	42	48	48	336	1266
DELIVERIES	733	35	36	46	416	1266

FY 86 RDT&E REQUEST

\$ 252.1

• F-15E	108.8
• MSIP	83.3
• TEST/ENG	20.3
• SPT EQUIP	19.0
• SIMULATOR	6.9
• OTHER	14.0

FY 86 WPN SYS PROC REQUEST

\$ 2138.9

• FLYAWAY	1654.9
• PEC SPT	424.4
• ADV BUY CREDIT	176.4
• ADV BUY	236.0

SCHEDULE

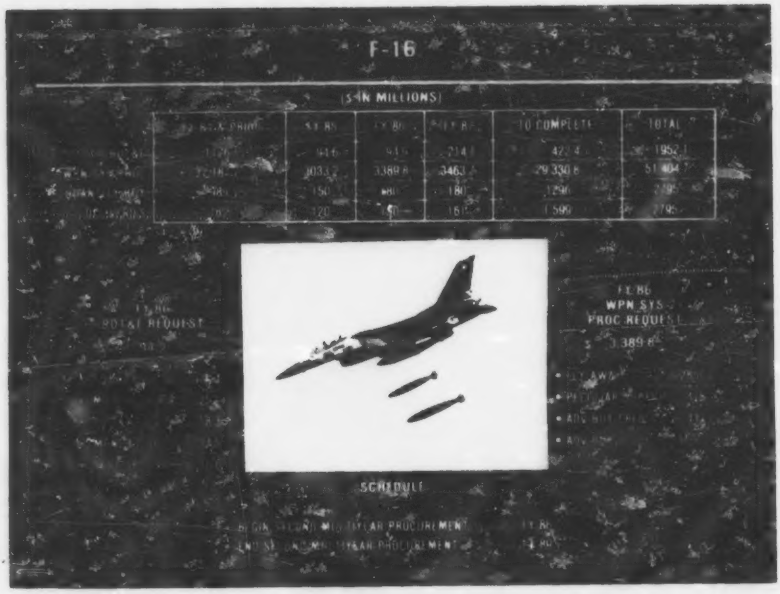
• FIRST MSIP AIRCRAFT	FY 85
• FIRST F-15E	FY 87
• MSIP RETROFIT BEGINS	FY 87
• F-15E IOC	FY 89

Slide [illegible]

F-15E

General ADAMS. Talking a little bit about the individual details of our F-15 program, our request is for 48 with long lead for an additional 48. Again, eight of those are F-15E's. This is a breakout of the procurement request. In RDT&E, \$108 million is for the E model development. Continuing the multiyear stage improvement program for \$83 million and these other things.

The first delivery of the F-15E is in fiscal year 1987 and its IOC is in fiscal year 1989.



F-16

($ IN MILLIONS)

[illegible]	FY 85	FY 86	FY 87	TO COMPLETE	TOTAL
[illegible]	[illegible]	94.6	93.5	214.1	422.4	1952.1
[illegible]	[illegible]	3033.2	3389.8	3463.4	29,330.8	51,404.7
[illegible]	[illegible]	150	180	180	1296	2795
[illegible]	[illegible]	120	150	161	1,599	2795

FY 86
RDT&E REQUEST
[illegible]

FY 86
WPN SYS
PROC REQUEST
$ 3,389.8

- [illegible]
- [illegible]
- [illegible]
- [illegible]

SCHEDULE

BEGIN SECOND MULTIYEAR PROCUREMENT FY 86
END SECOND MULTIYEAR PROCUREMENT [illegible]

SLIDE 21

F-16

General ADAMS. In the F-16 area, we have delivered 820 of these aircraft. It is currently used by nine nations worldwide. Our request this year is for 180 with long lead for 180 broken out like this: $26 million for the F-16F to increase range and payload of that aircraft primarily in the air-to-surface role; and $25 million to update radar, avionics and self-protection systems in the multistage improvement program.

We begin our second multiyear procurement this year and that is a 4-year procurement at 180 aircraft with options in fiscal year 1988 and fiscal year 1989 for an additional 36 add-ons to get to the 216 for the F-16.

Dr. COOPER. General, may I interrupt for a minute.

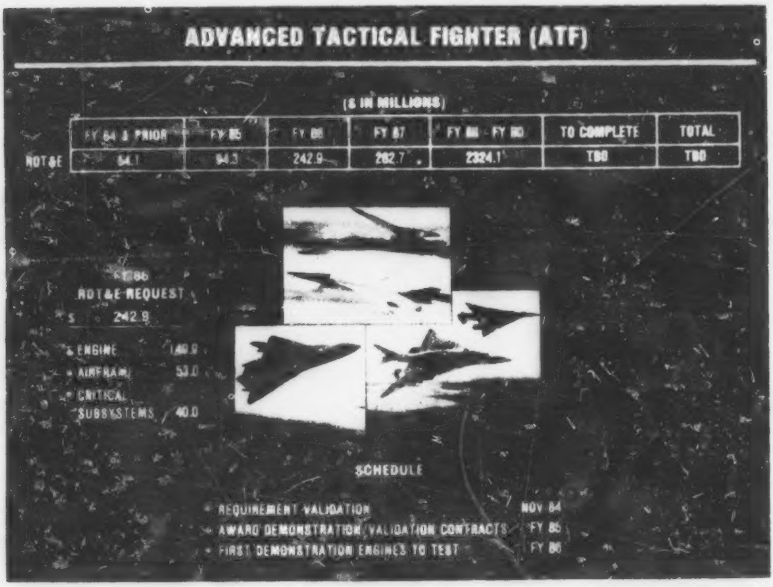
EUROPEAN COOPERATION

Mr. Chairman, we reached a significant milestone in the F-16 program. The committee is aware that in the mid-1970's we entered into an agreement with four of our European allies, the Danes, Norwegians, Belgians and the Dutch to coproduce 998 F-16's. The United States procured 650 of the 998 and the Europeans procured 348.

In February of this year the Europeans took delivery of the last of the 348 aircraft in Belgium at the SABCA facility. It really has been a very remarkable program.

I know we get criticized for not being able to work jointly with our sister services in the DOD, but when you consider that five nations have cooperated on a program of this magnitude and it has been as successful as it has, it is quite a tribute to that program.

There will be follow-on buys, the Dutch, the Belgians and the Danes have signed for follow-on buys, so the program continues, but the original program has now concluded. It has been extremely successful.



ADVANCED TACTICAL FIGHTER (ATF)

($ IN MILLIONS)

	FY 84 & PRIOR	FY 85	FY 86	FY 87	FY 88 - FY 90	TO COMPLETE	TOTAL
RDT&E	64.1	94.3	242.9	262.7	2324.1	TBD	TBD

FY 86
RDT&E REQUEST
$ 242.9

• ENGINE	149.9
• AIRFRAME	53.0
• CRITICAL SUBSYSTEMS	40.0

SCHEDULE

• REQUIREMENT VALIDATION	NOV 84
• AWARD DEMONSTRATION/VALIDATION CONTRACTS	FY 85
• FIRST DEMONSTRATION ENGINES TO TEST	FY 86

Slide 22

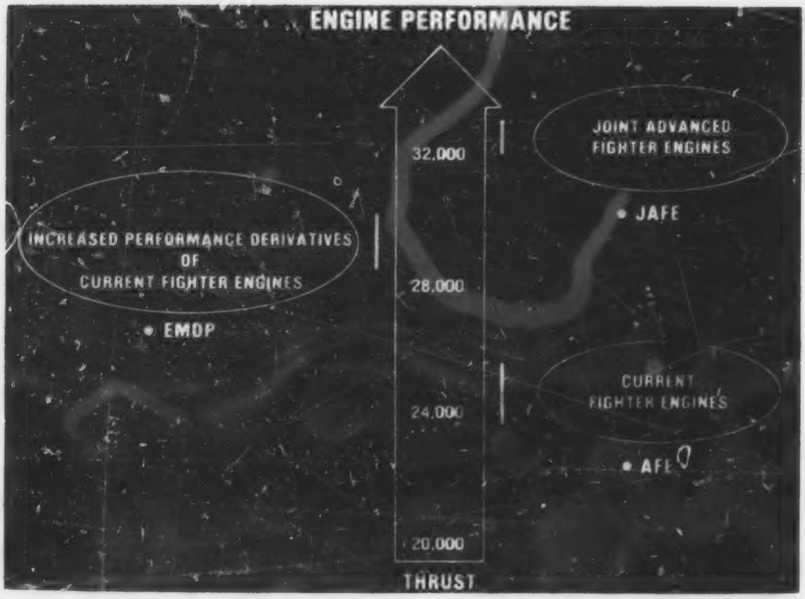
ATF

General **Adams**. For the Advanced Tactical Fighter, a follow-on air superiority aircraft to the F-15, our fiscal year 1986 request is broken out into three areas. The major portion of the money goes for the development of the Joint Advanced Fighter Engine.

In the airframe area we have seven contractors working on design. This money will go for aircraft and wind tunnel work.

In the critical subsystems we are requesting $40 million. This is to continue to develop the avionics integration, to insert the very high-speed circuits and look for areas to reduce the technological risk and to reduce the cost.

We will move into the demonstration and validation phase this year. The first engines to be tested will be full up in fiscal year 1986. I will discuss the engines a little bit more.



ENGINE PERFORMANCE

JOINT ADVANCED FIGHTER ENGINES

• JAFE

INCREASED PERFORMANCE DERIVATIVES OF CURRENT FIGHTER ENGINES

• EMDP

CURRENT FIGHTER ENGINES

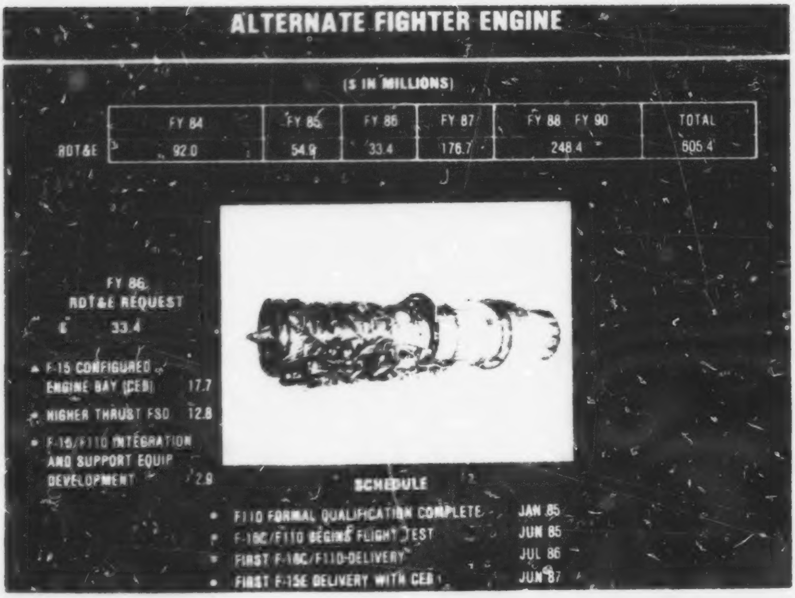
• AFE

Slide 25

AIRCRAFT ENGINES

We have also a road map for our engines as we discussed last year. This committee is familiar with the competition held between Pratt & Whitney and G.E. to increase durability and reliability on our current engines. That was done on the Alternate Fighter Engine program.

We are looking now to maintain that same level of durability in the Pratt & Whitney and G.E. engines. We intend to compete them at this level of increased thrust to provide increased performance and to remain competitive with the evolving Soviet threat. The new engine developed for the Advanced Tactical Fighter, the JAFE, will be in this thrust range.



ALTERNATE FIGHTER ENGINE

($ IN MILLIONS)

	FY 84	FY 85	FY 86	FY 87	FY 88 FY 90	TOTAL
RDT&E	92.0	54.9	33.4	176.7	248.4	605.4

FY 86
RDT&E REQUEST
$ 33.4

- F-15 CONFIGURED ENGINE BAY (CEB) 17.7
- HIGHER THRUST FSD 12.8
- F-16/F110 INTEGRATION AND SUPPORT EQUIP DEVELOPMENT 2.9

SCHEDULE

F110 FORMAL QUALIFICATION COMPLETE	JAN 85
F-16C/F110 BEGINS FLIGHT TEST	JUN 85
FIRST F-16C/F110 DELIVERY	JUL 86
FIRST F-15E DELIVERY WITH CEB	JUN 87

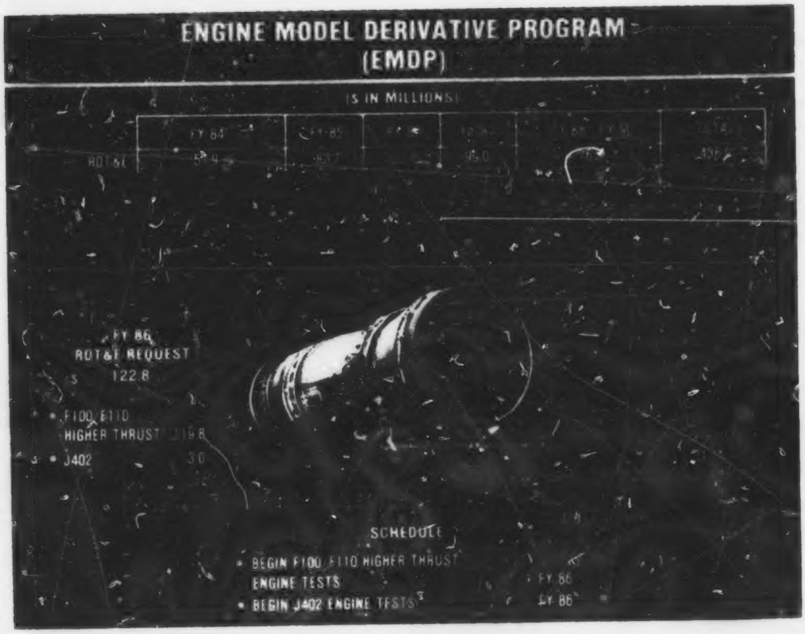
Slide [illegible]

ALTERNATE FIGHTER ENGINE

I will discuss each of these just briefly.

In the Alternate Fighter Engine area, our request for $33 million is broken out this way. We are configuring the engine bay of the F-15 so that it can be tailored to accept either the G.E. or the Pratt & Whitney engine.

We are gearing up to do the full-scale development proof testing on the higher thrust engine. The first F-16 flight test begins this summer with the F-110 engine and then the first delivery of the F-16 with the General Electric F-110 engine occurs next summer.



ENGINE MODEL DERIVATIVE PROGRAM (EMDP)

($ IN MILLIONS)

	FY 84	FY 85	FY 86	FY 87	FY 88-FY 91	TOTAL
RDT&E	5[illegible].4	[illegible]	[illegible]	95.0	[illegible]	496.[illegible]

FY 86 RDT&E REQUEST $ 122.8

- F100/F110 HIGHER THRUST 119.8
- J402 3.0

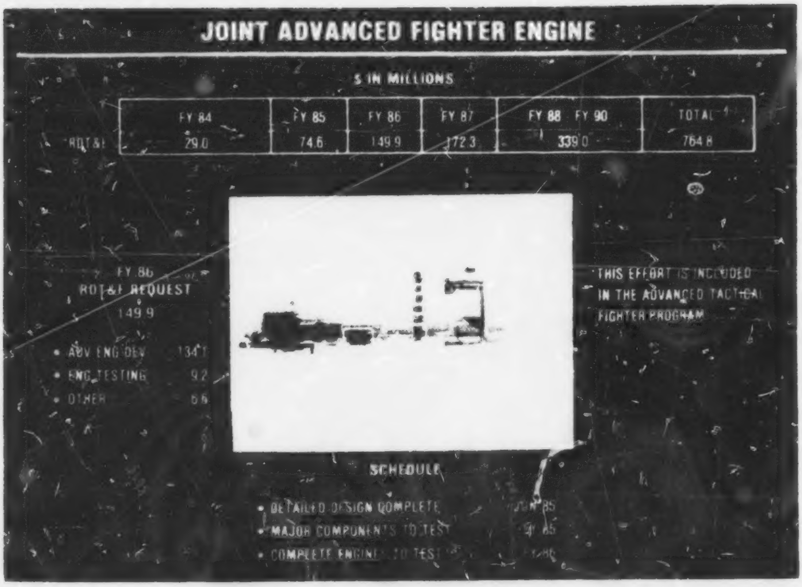
SCHEDULE

- BEGIN F100/F110 HIGHER THRUST ENGINE TESTS FY 86
- BEGIN J402 ENGINE TESTS FY 86

SLIDE 2

EMD PROGRAM

In the Engine Model Derivative program, the program for developing a higher thrust engine, this is our request. Nearly all of it goes for the development of the higher thrust engine with a small amount of money being devoted to work with the Harpoon engine in conjunction with the Navy.



JOINT ADVANCED FIGHTER ENGINE

$ IN MILLIONS

	FY 84	FY 85	FY 86	FY 87	FY 88 - FY 90	TOTAL
RDT&E	29.0	74.6	149.9	172.3	339.0	764.8

FY 86
RDT&E REQUEST
149.9

• ADV ENG DEV	134.1
• ENG TESTING	9.2
• OTHER	6.6

THIS EFFORT IS INCLUDED IN THE ADVANCED TACTICAL FIGHTER PROGRAM

SCHEDULE

• DETAILED DESIGN COMPLETE	JUN 85
• MAJOR COMPONENTS TO TEST	JUL 85
• COMPLETE ENGINE TO TEST	1986

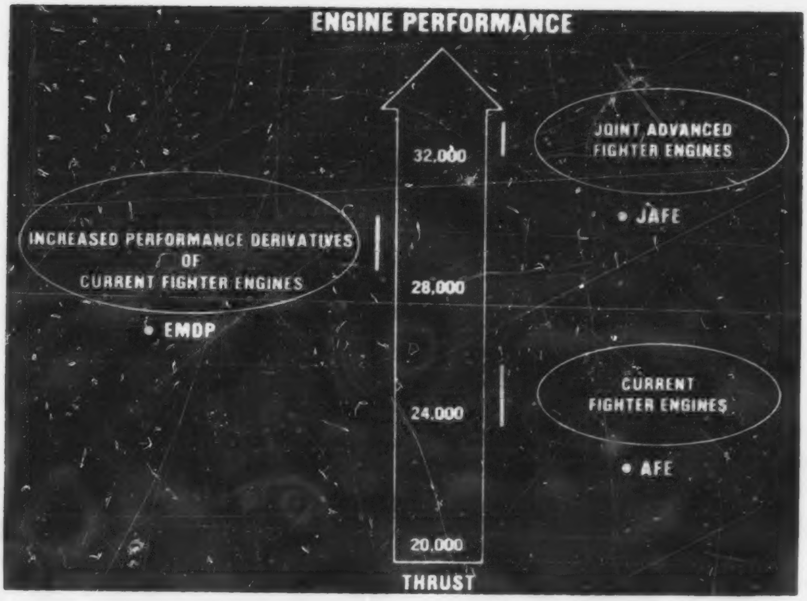
SLIDE 2

JOINT ADVANCED FIGHTER ENGINE

This is our request. The advanced engine for the Advanced Tactical Fighter, the JAFE. It is advanced development money here. We look for full-up engine development test to begin in 1986. That is at least 2 full years in advance of the full-scale development decision for the Advanced Tactical Fighter aircraft.

It puts us well ahead of where we were in the F-15 development and the engine that went into that aircraft.

Dr. COOPER. General Adams, if I could just interrupt you, can you put the thermometer back on?


ENGINE PERFORMANCE
32,000
28,000
24,000
20,000
THRUST
INCREASED PERFORMANCE DERIVATIVES OF CURRENT FIGHTER ENGINES
• EMDP
JOINT ADVANCED FIGHTER ENGINES
• JAFE
CURRENT FIGHTER ENGINES
• AFE

SLIDE 27

COMPETITION

Mr Chairman, this has been a program that has been of intense interest on the Hill and this particular committee has held hearings on it during the year. I would like to give you a little more of a status report on where we are on the engine competition for higher durability engines.

As you will recall, last year, and that is the lower right-hand part of the thermometer for a 24,000-pound class engine, there was an intense competition between the Pratt & Whitney F100-220 and the General Electric F110 engine.

Mr Orr made the decision to put the new General Electric engine in all new F-16's and to put the Pratt engine, the F100-220 which is a vastly improved version of the old F100, into the F-15.

Quite frankly, that was of some considerable concern to Pratt & Whitney because it apparently knocked them out of the F-16 business.

FIGHTER ROAD MAP

If you will look at our Fighter Road Map, you will see the majority aircraft we will be buying over the next few years are F-16's. In January, Mr Orr made the decision for the second year of that buy and his decision was to split the engine buy roughly 50-50 between Pratt and General Electric. General Electric came out slightly ahead. They are getting 54 percent of the business and Pratt & Whitney is getting 46 percent of the business.

What is significant about this year's decision, though, is that Mr. Orr decided to put at least a wing's worth of F-16's with the Pratt engine. He left the Pratt engine in the F-16's, gave the majority of the F-16 business this year to the G.E. engine, but gave some of the F-16 business back to Pratt.

I think what is significant to Pratt is that they are back in the F-16 business.

In addition, Secretarry Orr made a decision to configure the inlets on all new F-15's and the engine bay, in such a manner that in the future those aircraft can take the General Electric engine.

So, I think the Air Force has now postured itself so that we will have competition in the future with both engines in both aircraft. I think that puts us in a very good position. It puts those two great engine manufacturers head to head, and I think that is in the long-term best interests of the Government.

I think, quite frankly, it is fair to both contractors. They will both have a fair shot at Air Force business in the future. We have been extremely pleased with the results of that competition.

HIGHER THRUST ENGINES

The next phase now is to go to higher thrust versions of both of those engines and we believe that we can do that and at the same time maintain the durability levels at roughly the same level that we have achieved with the AFE engines.

We do not have a final decision from Mr. Weinberger yet, but I can tell you what we are thinking about. What the Air Force has proposed is that we now increase the thrust into the 29,000-pound class for both of those engines. We would like to do that while at the same time maintain the durability levels that we currently have. As you recall, our primary problem back in the late 1970's was with durability. We don't want to sacrifice durability.

WARRANTIES

Out of the competition we want to get good warranties. We have gotten very fine warranties out of the alternate fighter engine competition. We would like to get similar warranties out of the next competition for the higher thrust engine.

We would also like to gain access to proprietary data which is what we got out of the AFE competition. That allows us to break out if we see fit.

We also would like to get preprice production options for up to 6 years. We are using the same template we used for the AFE competition. Our proposal would be to have these engines available in the 1989 timeframe. That is about as soon as it would be possible.

Therefore, in the 1990's we would have engines available for F-15's and F-16's that have thrust levels on the order of 29,000 pounds.

I might mention that in our budget request that General Adams has gone over we are fully funded to carry forward with that proposal if it is acceptable to the Secretary of Defense. I am not aware that there are any problems. We just haven't had an opportunity to sit down with him and gain his approval yet. I anticipate that will be forthcoming in the not too distant future.

Senator STEVENS. That is a good report. I remember so well sitting here and asking the questions about thrust and being told that for the pilot the thrust is not a consideration. That is within the last 5 years, Mr. Secretary.

We got into this problem because, in my judgement, the Air Force did not give the engine manufacturers a complete statement of goals and really left us in a position that really left thrust out of the competition.

I congratulate you for getting it back in.

Senator CHILES. They kept saying thrust was not part of the competition.

Senator STEVENS. That was started 6 years ago.

Dr. COOPER. Seven years ago, sir.

Senator STEVENS. The real problem now is to get us in a position where we can maintain competition on a fair and equal basis.

Dr. COOPER. Yes, sir.

COMPETITION

Senator STEVENS. I congratulate you. I hope we will get to the right point. I am old-fashioned, I would like to get back to the point where you put out specifications and have real competition and have a winner take all contest and the whole airplane.

We are dealing with too many complex components now and we get lost sometime as we did, I think, on this engine competition through this period we have been through. If we get back to the point where we have all relevant factors involved in the competition, I think in the long run you will save the Government money.

ENGINE THRUST

Dr. COOPER. Could I comment one moment further on the thrust issue.

What we really said in the past was that thrust was not the issue in the AFE competition. Quite frankly, I think that was a prudent position.

Senator STEVENS. No. You said thrust was not an issue. No one asked you to make it the issue. We wanted to make it one of the criteria involved in the competition.

Dr. COOPER. One thing that caused us problems with durability on the older version of the Pratt engine was thrust.

Quite frankly, the temperatures and the flow rates that were going through the hot section of that engine were greater than the engine could withstand over a reasonable period of time. As a result, that engine was wearing out at about half the expected lifetime because of the thermal stress. The fatigue that was placed on the blades was excessive, given the material and the cooling techniques that we had at the time.

I really think it was appropriate for the Air Force over the past 4 years to focus on durability while holding the thrust level constant because, quite frankly, to me it makes little sense to try to increase the thrust at the same time you are trying to address the durability problem because the thrust and flow rate are causing the problem.

We think we have adequately addressed that now. The engines we are procuring in this timeframe are adequate to meet the performance requirement that we have in this timeframe. As we grow the F-16 and we grow the F-15 into the E model and potentially into the F model, they become heavier and there is a longer term requirement for higher thrust engines.

What we are hoping to do is to increase that thrust level and not diminish the durability level that we have obtained out of this competion. I think we can do that and the reason we can is that we have developed better materials and better cooling techniques.

Not to be contentious, but I think the program is very well phased in terms of first addressing durability and then upping the wick to get the increased thrust.

Senator **Stevens**. You are not being contentious as far as I am concerned. At my request, we added $50 million in fiscal year 1984, $73.5 million in fiscal year 1985 solely for thrust. We had to force feed the Department to think about thrust.

I am glad to see you come in this year and tell us you are going into a new generation of thrust. We have been conscious of space and weight and durability. We had an engine manufacturer come in with a high thrust in the competition and that engine was being selected, but everybody was telling us it was not selected because of thrust and we knew very well it was.

That led to the unfairness in the competition. I don't want to belabor it. I do belabor the fact that we are getting to the point where really the competition follows on rather than actually takes place at the time of the initial procurement. I will get into that later.

Do you have anything more?

General **Adams**. I have finished, sir. Thank you.

[The joint statement of Dr. Cooper and General Russ follows:]

JOINT PREPARED STATEMENT

DR. THOMAS E. COOPER
ASSISTANT SECRETARY, AIR FORCE RESEARCH, DEVELOPMENT AND LOGISTICS

LT. GEN. ROBERT D. RUSS, USAF
DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION

Introduction

Over the past four years, the President has implemented a bold and decisive plan to arrest the dangerous trend toward Soviet military superiority. The results of the real growth in our military investment during the last four years can be seen in more combat capable military forces, progressively modernized weapons, improved Air Force readiness and sustainability rates. Our Fiscal Year 1986 research, development, procurement and logistics budget request is structured to sustain the progress that we have made and to continue the President's program. The priorities reflected in this budget request, which are consistent with the original program, are: modernize strategic forces, improve combat readiness and sustainability, enhance force projection, modernize and expand our theater forces and exploit possible opportunities in space.

Completing the Plan

Restoration of the military balance depends heavily on implementation of the plan we began in 1982. The Air Force's Fiscal Year 1986 budget request has been developed on a solid foundation formed by the funding provided by the Congress over the last four years. This request reflects our critical and thorough assessment of required military capabilities, program priorities and resource limitations. It embodies a rational balance among these competing considerations. The Air Force's Fiscal Year 1986 budget request is important to ensure that the course we have set toward an assured deterrent posture can be achieved in the most efficient and cost effective manner.

Balanced Combat Capability

The Air Force Fiscal Year 1986 budget request represents a deliberate and prudent balance between and within the investment and operating accounts. This budget will give the Air Force combat capabilities with which to respond to current and future military challenges across the full spectrum of conflict. The Air Force's 1986 request provides a balanced capability to maintain security at home and to honor wide-ranging U.S. commitments abroad. At the same time, it provides the proper balance between funding for current readiness and sustainability and investment in the development of future capabilities.

Today's investment in research, development, test and evaluation, procurement and military construction provides tomorrow's force structure capability and growth. In Fiscal Year 1986, about 58 percent of our total request is for investment programs. To maximize return on this investment, the Air Force has taken several management initiatives to enhance program stability, control cost and to revitalize the industrial base. Prudent management of our defense dollars yields not only lower acquisition cost but also lower life cycle cost.

Science and Technology

United States technological superiority over the Soviet Union is no longer unchallenged. Through a combination of steadily growing research and development (R&D) investments and covert means, the Soviets have narrowed the gap in technological sophistication. We have today modern and capable systems only because we made prudent investments in our technology base as long as 30 years ago. The capabilities of tomorrow's major weapon systems will be directly traceable to today's investments in science and technology.

Strategic Forces

Strategic force modernization is our top mission area priority. The credibility of America's deterrent posture depends on Soviet perceptions that we have both capable strategic forces and the national resolve to use them. The existing numerical strategic force balance coupled with the rapid pace of Soviet modernization diminish that credibility. To overcome this, our budget request continues to emphasize the President's program to restore a stable balance of strategic power, send a clear signal of U.S. national resolve and encourage the Soviet Union to meaningfully negotiate verifiable nuclear arms reductions.

ICBM modernization provides a response both to the pace and scope of Soviet ICBM development and deployment and to the significant aging of the current U.S. ICBM force. We are proceeding with the ICBM modernization program recommended by the President's Commission on Strategic Forces and subsequently approved by the Congress. The Commission recommended (1) promptly deploying 100 Peacekeeper missiles in existing Minuteman silos; (2) initiating engineering design of a single warhead ICBM leading to deployment in the early 1990s; and (3) vigorously investigating follow-on basing technologies, including hardened vehicles and silos.

The four stage Peacekeeper missile will be more accurate, carry more warheads, have greater range, and be more resistant to nuclear effects, such as EMP, than current ICBMs. This enhanced capability will begin to offset the Soviet threat to present U.S. ICBM systems and help deter nuclear attacks on the United States and our allies. Full-scale development for basing began in June 1983. Deployment of the first 10 operational Peacekeeper missiles will be achieved by December 1986. Fiscal Year 1986 funding will be used to continue missile production, conduct testing and evaluation and construct support facilities for deployment.

We are also continuing to aggressively develop a Small Intercontinental Ballistic Missile and a hardened mobile transporter. A three phase program strategy is being implemented by the Air Force. The system definition phase, which builds on Peacekeeper technology and assesses alternative technologies, is nearing completion. The pre-full scale development phase began in late 1984 and will continue with competitive contracting for weapon systems integration, for propulsion and for a hard mobile launcher. The full scale development phase for the basing mode or modes will begin in 1987.

The second and most flexible leg of our strategic offensive forces is the manned bomber. The mainstay of the current force is the B-52 strategic bomber, which is now augmented by the FB-111A and will soon be further augmented by the B-1B. Our bombers now have expanded conventional and maritime roles. Two squadrons of B-52 bombers have been modified to carry even larger conventional payloads as well as Harpoon missiles. They now perform sea lane defense, mine laying and sea control/surveillance missions.

The lead component of the President's two bomber program is the B-1B bomber. The first production model was delivered on 4 September 1984, and the first squadron will be operational at Dyess AFB, Texas by September 1986. As a follow-on to the B-1B, the Advanced Technology Bomber will exploit low observable technology to counter expected advances in Soviet defenses.

Due to its critical importance to deterrence, modernization of strategic command, control and communications (C^3) is the President's first strategic modernization priority. Resilient and enduring C^3 links betwen the National Command Authority and the commanders of strategic forces are vital. Our programs will modernize the Worldwide Military Command and Control System for automated command and support and will develop the Milstar satellite communications system to provide survivable, jam resistant and secure worldwide communications. Other high priority programs are the Ground Wave Emergency Network to provide assured communications between the National Command Authority and U.S. nuclear forces and the Defense Satellite Communications System which provides super high frequency secure voice and high data rate transmissions for defense and diplomatic users.

Strategic defense forces and systems are key elements of our deterrent posture because they provide timely, reliable and unambiguous warning as well as attack assessment. The 1982 comprehensive North American Air Defense Master Plan guides our strategy for modernizing air defense forces. Our aging systems are becoming more expensive and difficult to support. To redress this, we plan to deploy over-the-horizon backscatter radars to provide long range, all altitude, wide area surveillance over the oceans and southern approach areas. To compliment these, we plan to replace the Distant Early Warning radars with a combination of minimally and unattended long-range, all-altitude radars to cover the northern airways. In addition, F-15s, and F-16s will be added to our air interceptor forces.

The threat of Soviet missiles, especially sea launched, and space forces continues. Our sea launched ballistic missile warning system (PAVE PAWS) is urgently needed to ensure adequate coverage of longer range multiple reentry vehicles. The SPACETRACK program, which will improve our ability to monitor space activities, is the key to our warning and defensive options. The continued development of an anti-satellite system will ensure our capability to deter threats to U.S. and allied space systems.

The Department of Defense and the Air Force are aggressively pursuing the President's Strategic Defense Initiative (SDI) research program designed to determine if it's technically feasible to develop a defense against ballistic missiles. The Air Force is responsible for about 40 percent of these programs in the 1985-1990 timeframe. Several Air Force programs such as the Advanced Warning System and the Space-Based Surveillance System have now been integrated into the SDI. Experiments and demonstrations will be pursued to assess the feasibility of applicable technologies and to support development decisions in the 1990s.

Space systems have become an integral part of our military forces. They directly support both strategic and conventional forces by providing global data from space for defense missions. Spaceborne surveillance, warning, communications, meteorological and navigation systems significantly increase the effectiveness of our forces today; and we fully expect these spaceborne capabilities to become even more important to our forces in the future. To support our space operations, we require an infrastructure of survivable launch and on-orbit control facilities. Activation of the Vandenberg Air Force Base Space Shuttle launch site, development of the Inertial Upper Stage for payload insertion, modernization of the Satellite Test Center and the Satellite Control Facility, and construction of the Consolidated Space Operations Center will ensure future effective support and control of vital space operations.

Force enhancement is achieved through several programs which exploit space as a medium. The Defense Meteorological Satellite Program is our single most important source of environmental data, and the Navstar Global Positioning System provides a highly accurate three-dimensional radio navigation capability.

Readiness and Sustainability

Maintaining the readiness and sustainability of our combat forces remains our second priority. Ready forces form the basis of our capability to engage the enemy effectively on the first day of fighting. Readiness is the sum of proficiency and sufficiency; it requires that forces be trained under realistic conditions and stocks of spares be available at the beginning of combat. Sustainable forces must have the "staying power" to fight during and beyond an initial period of combat. To do that, they depend on the nation's ability to generate adequate spares, supplies, munitions and fuel to replace those resources consumed or attrited in battle. Moreover, sustainability results only when peacetime stocks, the support infrastructure, war reserve material and the industrial base permit it.

Since 1981, we have sought to reduce serious shortfalls in peacetime and wartime stocks while preserving ready forces. With the 1985 appropriations, our inventories are healthier than they have been in years. This year's request will continue to emphasize funding of peacetime and wartime reserve spares. In addition, emphasis will be given to initial spares for the B-1B strategic bomber, the Peacekeeper Strategic Missile and the C-5B airlift aircraft. Replenishment aircraft spares and missile spares also require continued support to maintain both high level peacetime readiness and wartime sustainability.

Simulators and trainers continue to grow in importance as we strive to provide realistic training to aircrews. More efficient and effective trainers promise important combat returns on our investment. Weapon system modifications accomplish three things: they improve reliability and maintainability and increase service life, they improve capability and they improve safety. Structural and electronic modification programs are extending the life of C-130, KC-135 and F/RF-4 airframes and enhancing the avionics capabilities of F/FB-111 and B-52 aircraft. Finally, we continue to fund war consumables and aircraft common ground equipment to further strengthen our responsive combat forces.

Force Projection

Our third mission priority is to enhance force projection. Our nation's military strategy depends on a mix of U.S. based and forward deployed forces. Airlift, sealift and prepositioned mobility forces serve as the link between our force structure and its combat power. Together they provide the means to rapidly project and sustain a balanced fighting force on a global scale. Although the mobility forces are complementary, only airlift provides the flexibility and rapid means to respond to time-sensitive situations.

The Congressionally Mandated Mobility Study formed the basis for the Airlift Master Plan. Although past favorable funding has increased our inter-theater airlift significantly, we are requesting a continuation of measured growth to achieve the master plan goals. These goals are three phased: near, mid and long-term force improvements.

Near term improvements include C-5A and C-130 wing modifications to extend airframe life and the purchase of a variety of Operational Support Aircraft. Mid-term improvements include augmenting our force projection and airlift fleet with KC-10s and improved C-5Bs and funding the Civil Reserve Air Fleet enhancement program to modify existing commercial aircraft for use in a national emergency. Far term improvements rest on the development and procurement of the intercontinental C-17 airlifter. The C-17 will provide an interand intratheater outsize capability not currently available.

Specialized airlift requirements are being driven by contemporary events such as an increase in terrorism and a realignment of service functions. It is essential that the U.S. maintain special operations forces capable of conducting missions throughout the world. We are therefore requesting additional MC-130H Combat Talon aircraft and asking for faster development of the advanced vertical lift aircraft to bridge the gap between helicopters and fixed wing aircraft. To meet its responsibilities for combat rescue and recovery deep behind enemy lines, the Air Force requires additional improved rotary wing aircraft. The HH-60A helicopter with improved avionics and precision navigation will provide this low-level night and under-the-weather capability.

Theater Forces

Modernizing and expanding our theater forces represent the fourth mission area priority. Last year, events in the Persian Gulf and Central America demonstrated the global nature of U.S. commitments. We have increased emphasis on sharing mission responsibilities among active and air reserve forces and on exploiting our technology advantage to counter numerical superiority. Our budget request strikes a prudent balance between modernization and expansion and the supporting programs which improve near term readiness and sustainabilty.

The Air Force's Tactical Fighter Roadmap outlines our procurement strategy for a total fighter force. The roadmap applies the composition of today's force against worldwide theater fighter requirements. The three components of the recommended roadmap strategy are: procurement of additional fighters toward development of a 40 tactical fighter wing force plus an adequate air defense force; an appropriate mix of fighters for flexibility to accomplish specialized and multirole missions; and quality improvements to accomplish more demanding high threat missions. The F-15 will remain the primary air-to-air fighter, but the procurement of additional F-16s will make the F-16 the backbone of our force structure. The centerpiece of the roadmap is the acquisition of the F-15E which augments the limited F-111 fleet in the night/adverse weather deep interdiction role and performs an air-to-air and air-to-surface mission. Our next-generation 1990s aircraft is the advanced tactical fighter. It will exploit advancing technology and ensure we can meet the evolving Soviet threat. Quality improvements to our existing fighters include the continued development and deployment of the Low Altitude Navigation and Targeting Infrared System for Night. Improved fighter engines are now being procured for F-15s and F-16s and increased performance engines will be developed for F-15s/F-16s for use in late 1980s.

Our current munitions inventory includes a large percentage of older weapons for today's high threat tactical environment. The Air Force Munitions Acquisition Plan guides procurement of munitions that are the most cost effective, i.e., that have greater success rates with reduced aircrew loss. While the Advanced Medium Range Air-to-Air Missile is our next generation air-to-air missile, we must continue to procure the reliable AIM-7M and AIM-9M missiles to adequately arm our aircraft. We also plan to procure additional air-to-surface munitions such as the Imaging Infrared Maverick, Combined Effects Munitions and airfield attack weapons. We intend to develop effective standoff attack weapons to ensure effectiveness against high value fixed and mobile surface targets.

Modernizing theater forces also requires improving our defensive and electronic combat suppression capabilities, airborne tactical warning and control, anti-jam and secure voice aircraft communications and tactical reconnaissance. Finally, the continued deployment of the Ground Launched Cruise Missile and the development and deployment of a credible chemical retaliatory weapon will reestablish a credible theater deterrent within those weapons families.

Acquisition Management Improvement

The success of the Air Force research, development and acquisition program depends on a strong, efficient management system. During the past two years the basic process through which we acquire complex weapon systems has been subjected to meticulous evaluation, and numerous management techniques have been refined to insure better control of our resources. In conjunction with this budget submission, a broad range of these improvements will be continued.

High costs of systems are being reduced through a variety of techniques including multiyear contracting, leader-follower practices, dual sourcing, recompetition and other techniques. Reforming spare parts and support equipment acquisition is a top priority. We are dedicated to increasing the rate of competition across the board in Air Force contracting and we have established the office of the Air Force Competition Advocate to further this goal. Firm goals and specific steps to reach them have been set in motion. Program stability continues to be an important management and programmatic objective.

Several industrial base initiatives are directed at improving both the quality and cost effectivensss of contractor-produced goods and services. The Air Force will maintain an active effort to build a sound industrial foundation for its research, development and procurement programs and to enhance wartime readiness and sustainability. The quality of our systems is receiving top level attention. We now require that reliability and maintainability be given the same priority as cost, schedule and performance.

Better Air Force contracts will be possible only through the fine efforts of our professional contracting staffs. Included among the 1986 initiatives are programs designed to improve training, lengthen program director assignments and reward the people who help strengthen our system of competition.

Conclusion

Since 1981, we have made substantial progress toward the commitment to ensure that our military capabilities are strong enough to fulfill their vital purpose. To support this commitment, Air Force RDT&E and procurement programs are prudently structured to sustain the progress achieved. The Fiscal Year 1986 budget request continues a careful balance based on a realistic assessment of the threats. The success of this commitment depends substantially upon completion of the plan initiated with the FY 1982 budget.

Congressional approval and funding for our Fiscal Year 1986 budget request will allow us to continue the plan, restore our position of strength, demonstrate unified national resolve and protect and defend worldwide national interests.

Biography
United States Air Force

Secretary of the Air Force Office of Public Affairs Washington D.C. 20330

DR. THOMAS E. COOPER

Dr. Thomas E. Cooper is assistant secretary of the Air Force for research, development and logistics, Washington, D.C. He is responsible for conceptual efforts on major new programs and for formulating, reviewing and executing the plans, policies and programs related to research and development, logistics and acquisition. His responsibilities span all major mission areas, including assigned space programs. He also serves as the Air Force acquisition executive. Dr. Cooper assumed his present duties in January 1983.

Dr. Cooper was born May 31, 1943, in Lindsay, Calif. From 1961 to 1970, he attended the University of California at Berkeley where he received a bachelor's degree (with honors) in engineering-mathematics, and master's and doctorate degrees in mechanical engineering.

Following graduation Dr. Cooper was an acting assistant professor of mechanical engineering at the University of California, Berkeley, from 1970 to 1971. In 1971 he joined the faculty of the Mechanical Engineering Department at the Naval Postgraduate School, Monterey, Calif., and was promoted to associate professor in 1974. In 1975 he was awarded academic tenure and the school's John Schieffelin medallion for excellence in teaching.

Chosen to be a Congressional Science Fellow during 1976, Dr. Cooper spent the year serving on the professional staff of the Committee on Armed Services, U.S. House of Representatives. Following his fellowship year Dr. Cooper was appointed as a professional staff member on the Armed Services Committee.

During his tenure on the Armed Services Committee, Dr. Cooper worked on a wide range of research, development and acquisition issues, dealing with both strategic and tactical programs, and with all areas of basic and applied research funded through the Department of Defense. In addition he handled all intelligence-related military programs and was the committee's liaison at the staff level with the House Permanent Select Committee on Intelligence. He also had responsibility for space programs and command, control and communications issues. Dr. Cooper served as the principal staff member to the Defense Industrial Base Panel of the Armed Services Committee that highlighted many of the fundamental problems in the industrial base and played a major role in drafting legislation relating to multiyear contracting.

Dr. Cooper has also worked for Procter & Gamble Co., Aerojet General Corporation the California State Division of Highways, and has served as an engineering consultant to the Lawrence Radiation Laboratory, Livermore, Calif.; the Naval Weapons Center, China Lake, Calif.; and the Naval Weapons Laboratory, Dahlgren, Va.

He is a member of the American Society of Mechanical Engineers, Sigma Xi, North American Research Society and Tau Beta Pi. In 1975 he was chosen as one of the "Outstanding Young Men in America", is listed in American Men of Science and Who's Who in the West, and is a graduate of Harvard's program on National and International Security Affairs.

Dr. Cooper and his wife Helen reside in Alexandria, Va. They have a daughter, Nicole.

LIEUTENANT GENERAL ROBERT D. RUSS

Lieutenant General Robert D. Russ is deputy chief of staff for research, development and acquisition, Headquarters U.S. Air Force, Washington, D.C. He is responsible to the U.S. Air Force chief of staff for all U.S. Air Force research, development and acquisition programs.

General Russ was born March 7, 1933, in Portland, Ore. He graduated from Wapato (Wash.) High School in 1951 and received a bachelor's degree in business administration from Washington State University, Pullman, in 1955. He was a distinguished graduate of the Air Command and Staff College at Maxwell Air Force Base, Ala., in 1965 and the same year received a master's degree in business administration from The George Washington University in Washington, D.C. The general graduated from the National War College at Fort Lesley J. McNair, Washington, D.C., in 1973.

He was commissioned a second lieutenant through the Air Force Reserve Officers' Training Corps program at Washington State University. He entered active duty in September 1955 at Lackland Air Force Base, Texas. He completed pilot training at Webb Air Force Base, Texas, in October 1956 and subsequently attended F-84F gunnery school at Luke Air Force Base, Ariz., and F-100A gunnery school at Nellis Air Force Base, Nev.

In May 1957 General Russ was assigned to the 81st Tactical Fighter Wing at Royal Air Force Station Bentwaters, England, flying F-84F's and later F-101A's. Completing this tour of duty in May 1960, he transferred to the 437th Fighter-Interceptor Squadron at Oxnard Air Force Base, Calif., where he flew F-101B's. Moving to Hamilton Air Force Base, Calif., in May 1962, he served as chief of the Fighter Section, Directorate of Tactical Evaluation, 28th Air Division, until August 1964.

Following graduation from Air Command and Staff College in July 1965, General Russ was assigned to Air Defense Command headquarters, Colorado Springs, Colo. While there he served as a fighter officer in the Directorate of Tactical Evaluation and later as aide to the commander, Air Defense Command. After attending F-4 replacement training at Davis-Monthan Air Force Base, Ariz., from July 1967 to January 1968, General Russ was assigned to the 12th Tactical Fighter Wing at Cam Ranh Bay Air Base, Republic of Vietnam, where he flew 242 combat missions, of which 50 were over North Vietnam.

Upon returning to the United States in March 1969, he was a plans officer in the Fighter/Reconnaissance Branch of the Force Development Directorate, Office of the Deputy Chief of Staff, Plans and Operations at Air Force headquarters. He moved from the Air Staff to the Organization of the Joint Chiefs of Staff in December 1970 and served as plans officer for general purpose forces, J-5, Directorate of Plans, until July 1972.

He graduated from the National War College in June 1973 and was assigned to the 68th Tactical Air Support Group at Shaw Air Force Base, S.C., as vice commander. He held that position until becoming deputy commander for operations of Shaw's 363rd Tactical Reconnaissance Wing in January 1974.

General Russ was vice commander of the 4th Tactical Fighter Wing at Seymour Johnson Air Force Base, N.C., from February 1974 to August 1975, when he became wing commander. In February 1977 he became assistant deputy chief of staff for plans at Tactical Air Command headquarters, and in July 1977 was named the command's assistant deputy chief of staff, operations, for operations and training. He assumed duties as assistant deputy chief of staff, operations, for control and support, in July 1978.

In November 1979 General Russ returned to Air Force headquarters and was appointed director of operational requirements, Office of the Deputy Chief of Staff, Research, Development and Acquisition. The general was named vice commander of Tactical Air Command, with headquarters at Langley Air Force Base, Va., in October 1982 and assumed his present duties in October 1983.

The general is a command pilot with more than 4,500 flying hours. His military decorations and awards include the Distinguished Service Medal, Silver Star, Legion of Merit with one oak leaf cluster, Distinguished Flying Cross with two oak leaf clusters, Air Medal with 13 oak leaf clusters, Air Force Commendation Medal with one oak leaf cluster, Purple Heart, Air Force Outstanding Unit Award Ribbon with "V" device and five oak leaf clusters, Combat Readiness Medal, National Defense Service Medal, Vietnam Service Medal with five service stars, Air Force Longevity Service Award Ribbon with six oak leaf clusters, Small Arms Expert Marksmanship Ribbon, Republic of Vietnam Gallantry Cross with palm and Republic of Vietnam Campaign Medal.

He was promoted to lieutenant general Nov. 1, 1982, with same date of rank.

General Russ is married to the former Jean E. Johnson of Spokane, Wash. They have three children: Randall, Robin and Robert.

CBO REPORT

Senator **Stevens**. Let me say I normally follow the practice that the first person in the committee room will be the first to ask questions. I have violated that right now. If I may violate it further, we just received the CBO report which was done at our request. I don't think it is fair to ask you questions about the CBO report. I want you to have a chance to review it and the committee to review it.

We will have another hearing to go through the CBO suggestions with regard to what really is the target goal as far as wings are concerned. We have been under the impression that your target goal was 44 wings. We now see it is really sort of a moving target of 40 wings.

Your presentation this morning indicates we won't make 40 wings within the foreseeable future, even assuming the administration's budget request is approved, and we are told now to pare down to 3 percent real growth, and if you believe you are going to get that, you really do believe in the tooth fairy because we have to deal with the House. I believe it will be substantially below that.

As I pointed out in the opening statement, the substantial portion of the procurement is in this fighter procurement area. If there is a substantial reduction in the budget, by definition what you have laid out for us is not and cannot be the target for this year's budget, which leads us to one of the issues we will go into at a subsequent hearing when we go into the CBO report.

We would like to have you be prepared to tell us where you would pare down in terms of priorities. I will give you a set of assumptions.

One of them is an assumption that there will be a freeze that will require the Defense Department to absorb the rate of inflation.

The second assumption would be that you would have a budget which would give you a zero real growth, but you would be given sufficient money which would not impose on you the duty to absorb inflation.

The second one I think would be the 1½-percent level and the third one has to be the ceiling we are operating under, a 3-percent real growth.

What would be your Fighter Program under those assumptions? Where would you put the money?

We are tired of saying let us put it here, let us put it there, when we face a last-minute cut. I would like to see in the record a series of prioritizations as far as you are concerned. I am not talking just about tactical. I am talking about the complete procurement.

[The information follows:]

Procurement Prioritizations

The Air Force has taken a very close look at all variations of "freeze" proposals that either hold budget authority to the FY 85 level (nominal freeze), allow no "real growth" from FY 85 to FY 86 (FY 85 and inflation), and differing rates of real growth from 3-5%. The nominal freeze would result in a four percent real decline at a time when GNP is growing at seven percent. Each of these alternatives would equal large cumulative losses in programs from FY 86-90 that can be recouped. Though we have not identified nor prioritized specific programs, the more obvious total impact on combat capability would be that each alternative would delay essential modernization of strategic deterrent forces and delay needed improvements in readiness and sustainability. Specifically, spares and tactical munitions would be delayed. The wartime airlift shortfall that affects critical Army and Marine deployment requirements would be prolonged. Weapon systems development would be disrupted causing increased costs and prolonging dependence on less effective systems. Essential combat manpower needs and the effectiveness of the volunteer force would be jeopardized. A freeze of any sort would also counteract NATO objectives for minimum real growth, jeopardize U.S. leverage for arms control negotiations, and transmit a major change in U.S. resolve to allies and adversaries. The Air Force believes that the budget, as submitted in the FY 1986 President's Budget, reflects the proper balance between force structure and sustainability that is not only affordable and executable, but is the minimum required to ensure we maintain a strong aerospace deterrent force.

AIR FORCE PURCHASE OF F-20

Senator Stevens. Having said that, let me deviate further from our normal procedure. I am sure my friends will agree. I am told that the Senator from Wisconsin has another committee meeting he wishes to go to. I yield to him.

Senator Proxmire. Thank you, Mr. Chairman.

F-20

On April 3 the Wall Street Journal said the Air Force intends to purchase the F-20 beginning with the fiscal year 1987 at a rate leading to a total buy of 100 aircraft.

Is that report accurate?

Dr. Cooper. Senator Proxmire, I am not at liberty to go into what is going into the 1987 budget deliberations right now. I will tell you this much.

My boss, the Secretary of the Air Force, is very interested in putting as much competitive leverage as he can on all our acquisitions. The F-20 is something we are looking at. We think it would give us an opportunity to put competitive leverage on the F-16 and that is something that is on the table right now as we go through the budget drill in the Pentagon.

We are in the process of putting together our budget that we will submit to OSD for approval. But, no final decisions have been made by the Department of Defense because it has yet to go through the Defense Resources Board for their final judgment.

But it is an issue that we are looking at in the Air Force right now.

Senator Proxmire. I am glad to hear it. It seems to me the case of the F-20 is very, very strong.

Will you compare the 20-year operational and support cost of 1,000 aircraft flying 20 hours per month with the F-20 and the F-16?

Dr. Cooper. We can take that back for the record, Senator. The problem with doing that is that we don't have hard data on the F-20 operational and support cost data. It would be an estimate of what the F-20 costs would be.

TWENTY-YEAR COST OF F-16

Senator Proxmire. I am told that the F-16 20-year cost would be $31 billion. With the F-20, it is $15 billion or a $16 billion advantage to the F-20. In other words, the F-20 would be half as much.

Dr. Cooper. Again, we have to qualify because we have hard data only on the F-16. I think we have high confidence in our data on the F-16.

The F-20 is at best an estimate at this point.

General Russ, do you want to comment further?

General Russ. I was going to say in general you can state that the F-20 will be cheaper to operate than the F-16. How much cheaper we really don't know. You can make those figures however you want. We do have a set of figures.

Senator Proxmire. We will have to await greater understanding of the F-20 and the data on it?

General Russ. It depends on what capability you give the F-20 and a few other things. Certainly we can provide the committee——

Senator Proxmire. You are confident it would be less?

General Russ. My judgment is that it would be less.

Senator Proxmire. Is it accurate 1,458 F-20's could be bought and flown for the same 20-year life cycle cost of 192 F-16's with a virtual doubling of combat capability with no increase in the Air Force budget?

General Russ. That is a mouthful, sir. I will not sign up to that. I don't know. We would have to find out.

Dr. Cooper. I doubt it.

Senator Proxmire. Will you consider that and see what you can do for the record?

[The information follows:]

Flying Hour Comparison

The statement is not accurate as presented. However, it can be stated that the flyaway unit cost of the F-20 aircraft as presented in Northrop's unsolicited proposal is approximately 15 percent lower than the F-16C/D flyaway unit cost in FY 1985 dollars. For the operating and support costs, our initial estimate is that the F-20 is 20 to 30 percent lower than the F-16. The F-16 support costs are based on actual operational experience over the past five years while the F-20 projections are based on an unverified Northrop proposal. A significant amount of the delta cost between the F-16C/D and the F-20 unit cost is a result of subsystem difference (e.g., radar warning receivers, IFF equipment, navigation equipment data links, etc.). If the F-16 systems were replaced by the generally lower cost/less capable subsystems found in the F-20 and if provisions for additional equipment (LANTIRN, IFF interrogator, GPS) were removed from the F-16, the cost delta would decrease or be eliminated. Combat capability is extremely sensitive to the type of missions being flown and to the range/payload capability of the aircraft. The cost comparisons presented above in no way reflect an "apples to apples" comparison since they do not account for the differences in combat capability between the F-16 and F-20 aircraft.

ENGINE RELIABILITY

Senator Proxmire. Is it accurate that the F-16 has 50 hours between failures while the F-20 would have 190 hours? Would the F-16 last only 26 percent as long?

General Russ. The F-20 engine has shown a higher reliability than the F100 engine which is in the F-16 today. We have many modifications to the F-16 engine, like we have shown today, that certainly should put them in a similar area.

Dr. Cooper. Let me add further that the F110 engine that is going into the F-16 in the future and the F404 engine that powers the F-20 are the same technology engines. They are made by the same company and incorporate much of the same technology.

If you compare the F110 engine with the F-20 engine, that would be apples to apples and in the same time frame, I doubt that statement it true.

Senator Proxmire. I understand the F-16 has 34 man-hours per flying hour while the F-20 has 15.1.

Dr. Cooper. The last figures I saw on the F-16 were 26 maintenance hours per flight hour.

What did you say on the F-20?

Senator Proxmire. 15.1.

Dr. Cooper. Again, that is based on limited data for a small sample size. I can tell you what the F-16 is. I don't know what the F-20 is.

AIRLIFT SUPPORT

Senator Proxmire. Is it true it would require 20 C-141B's to support the 24 F-16's for 30 days while it would only take 8.6 C-141B's to support 24 F-20's for 30 days?

General Russ. It will take fewer of the C-141's and C-5's to deploy the F-20 than to deploy the F-16.

Senator Proxmire. Would you have a different and lesser demand for airlift?

General Russ. It would. If you gave the F-20 all the capability that the F-16 has, such as the LANTIRN and a few other things, then that difference would significantly be reduced. That is one of the reasons we are looking at the F-20 right now because of the reliability, and because of the decreased commitment on mobility and a few other points you raised.

F-16 ADVANTAGES

Senator Proxmire. Along that line, I understand the F-16 does have some advantages over the F-20 in acceleration, 7 to 12 percent faster, depending on elevation.

Is that accurate?

General Russ. It does have an acceleration advantage.

Dr. Cooper. It also has a payload advantage and a range advantage.

Senator Proxmire. Is it true the F-20 has 15 percent more combat time in air-to-air missions at .8 mach at 15,000 feet with a radius of action of 300 miles?

General Russ. I don't think so.

Senator Proxmire. For the record, will you correct that and make it as precise as you can?

General Russ. Yes, sir.

[The information follows:]

F-16 Advantages

The F-20, based on Air Force computed data, does not have 15% more combat time than the F-16. It is true that the F-20's 404 engine uses fuel more efficiently in afterburner and, given a fixed amount of fuel, the F-20 could fly longer in afterburner. However, since the fuel capacities and military power/cruise fuel specifics are different for the F-16 and F-20, additional consideration must be given regarding combat range and loiter time.

The following comparative data are based on several factors. Both aircraft have a similar load configuration, i.e., three external tanks and four AIM-9 missiles. External tanks are dropped prior to air-to-air engagement. The mission profile is a climb to optimum cruise altitude, enroute cruise to 300 miles from departure point, loiter at .9 Mach, then one minute of full afterburner and three minutes of full military power at 15,000 feet. This profile approximates a realistic air-to-air scenario. Under these conditions, the F-20 has a loiter capability, prior to combat, of 83 minutes compared to 120 minutes to the F-16. Comparison of the maximum combat radius using the same scenario, except with no loiter time, indicates the F-20 can go 540 NM compared to 790 NM for the F-16.

IMPROVED CAPABILITY

Senator Proxmire. If the Congress were to reduce funding for F-16 and F-18 aircraft, that would release enough funds to buy 32 F-20's? It will have more combat capability than 19 F-16's. There will be no increase in the budget, but there will be an increase in combat capability.

Should not the Congress take that action to improve capability?

General Russ. I am not sure we can buy 32 F-20s' with no follow-on buy. To be able to start the F-20 line, we need to make a commitment to a several-year program. It is not in production. There is no one buying the airplane.

That is why we are looking at the program in the fiscal year 1987 budget. We need to establish a program. If we should want to buy the F-20, we need to establish a program that covers several years.

Senator Proxmire. Have you discussed that with Northrop?

General Russ. That would be their fixed-price proposal to get the F-20 start.

COMPETITIVE PROCUREMENT

Senator Proxmire. Has any aircraft company ever made a proposal to the Air Force for a fixed unit price plus a fixed unit price for all materials and space parts for flying hours?

General Russ. No, but we have not asked for it. General Dynamics has told us if we ask them for it, they will provide them one. But we haven't asked for it.

Senator Proxmire. Does that not strike you it is a dumb way to buy and maintain aircraft with a guarantee of that kind?

General Russ. It strikes me as a good way, depending on what you are going to use the airplane for. If you are going to use the airplanes in the continental United States and not deploy them overseas, then that has a lot of benefits.

If you want to deploy the airplanes overseas, then you have some difficulty.

COST COMPARISONS

Senator Proxmire. Would you provide for the record the cost comparison between the F-20 and F-16 on the following lines:

No. 1, flyaway cost for each.

Procurement cost for each.

Three, program unit cost, procurement cost plus R&D cost.

Will you please provide the cost in current dollars and then-year dollars?

General Russ. Yes, sir. We will have to make some assumptions on total buy of F-20's to do that because if we just take the 32, it wouldn't be a reasonable answer.

Senator **Proxmire**. Based on the Northrop proposal.

General Russ. Yes.

[The information follows:]

Cost Comparison

The F-16 figures were based on the total F-16 program as shown in the 31 Dec 84 SAR. This includes 785 F-16 A/B's, 1646 F-16 C/D's and 364 F-16F's plus the procurement cost for improved performance engines. The F-20 cost are based on the Northrop unsolicited proposal and are subject to the assumptions and conditions of that proposal. A significant amount of the delta between the F-16 and F-20 unit costs is as a result of subsystem differences (jammers, RWRs, IFF equipment, navigation equipment, data links, etc). If the F-16 system were replaced by the generally lower cost/less capable subsystems found in the F-20 and if provisions for additional equipment (LANTIRN, IFF interrogator, GPS) were removed from the F-16, the cost delta would decrease. The cost comparision follows:

	F-20	F-16
In current year dollars (1985):		
Recurring unit flyaway	11.7	13.1
Procurement unit cost	17.8	16.9
Program unit cost	17.8	17.7
In then year dollars:		
Recurring unit flyaway	14.6	15.08
Procurement unit cost	15.9	19.64
Program unit cost	15.9	20.28

COMBAT AIRCRAFT INVENTORY

Senator **Proxmire**. How many combat aircraft is the Air Force purchasing this year compared to 5 years ago and 10 years ago?

General Russ. The request this year in 1986 is for 228 aircraft. In 1985 the appropriation was for 192 airplanes. Five years ago——

Senator **Proxmire**. Let me say that what I am concerned about is the actual increase.

How many aircraft are you losing each year to accidents and other causes?

General Russ. I think the chart tells you any year you would like to have, sir; 288 aircraft back in 1981, then 176 aircraft in 1982, 159 in 1983, 180 in 1984, 192 in 1985 and 228 requested this year.

Senator **Proxmire**. The reason I ask that question is that I wondered what the net effect is on the aircraft that you have that are available for action, net, attrition and net of accidents?

General Russ. I think the best way to answer that is that we need 6.5 aircraft per wing per year to maintain our force at the average age we need to maintain it and to level our force at the 40 tactical fighter wing level that we have discussed.

Our attrition over the past few years has been less than we normally anticipated because our accident rate is better. But we are not maintaining the level that we need to maintain to procure sufficient aircraft to maintain our force at the age.

That is why we are looking at some cheaper ways to buy airplanes such as the F-20 in the 1987 budget.

Senator PROXMIRE. I wanted to know what the actual inventory is, whether it is going up or down?

General RUSS. We have those figures. I don't have them with me. I will be glad to provide them for you.

[The information follows:]

LOSS OF AIRCRAFT

The fighter/interceptor/attack inventory for end of FY 1985 is projected to be 4,360 aircraft, an increase of almost 600 since FY 1980 but only 53 over FY 1984. Increases the past three years have been small, reflecting low production rates relative to total losses to attrition, retirement and FMS.

End of year inventories since FY 1980 with FY 1985 and 1986 projections are shown below:

Fiscal year:	
1980	3,788
1981	3,971
1982	4,115
1983	4,283
1984	4,307
1985	4,360
1986	4,391

COMPETITION

Dr. COOPER. Mr. Chairman, may I respond to one question that the Senator asked, why it was a good idea to decrease from 180 to 161 F-16's?

In looking at the F-20, whatever we do long term we should do it in a competitive environment. I think the competition will bring out the true cost on either side of the ledger.

If you are asking F-16 versus F-20 right now to some extent to try to provide hard answers to those questions, we are comparing apples to oranges. This is because we have one aircraft in the inventory that we have had in the inventory for the better part of 10 years and we have hard data. The other one is not in production.

We have several flight test aircraft and we have estimates of what the maintainability will be, and, by the way, it looks very attractive. We have some estimates of what the production costs will be, but until we get firm proposals, such as head-to-head bid to Air Force specifications that include all the logistics considerations we will not know for sure. Furthermore, you must include the hidden cost of setting up a whole separate logistics train for new aircraft, and there is a hidden cost there because right now if you buy additional F-16's, you field off a logistics base that is currently in place.

If you buy a new aircraft and put it into the inventory, you have to set up a whole separate logistics supply train.

All of those things need to be considered. I think they need to be considered long term in a head-to-head competitive environment. That is the issue that is currently being discussed within the Department of Defense and I have to tell you there has been no decision taken on it.

I will tell you, and I think Mr. Orr told you when he was here before, he is very interested in getting as much competitive leverage as he can on all Air Force acquisitions. That is very attractive to him. He sees one as leveraging the other.

As far as making commitment today, one versus the other, we are reluctant to do that.

Senator **Proxmire**. I would like you to keep me currently informed.

FREE ENTERPRISE INITIATIVES

Senator **Stevens**. Let me make a statement. I remember as a boy going over to what was Englewood Field and watching flyoff. It got me very interested in that. I ended up wanting to fly.

The real point of the comment is the Department really got away from competition in the acquisition of airplanes. You have competition in the acquisition of parts. This is the first time we have seen an aircraft manufacturer step forward and complete an airplane and challenge you to say that it does not perform to meet the standards that are necessary.

It was done, obviously, for export. It can't be exported because all of the countries of the world want what you have that has the stamp of approval of the Department of Defense on it. If it ever is going to be exported, it will have to be used by the DOD first.

Beyond that some of us would like to return to the concept where we compete airplanes and not parts. We think we would have greater control and fewer of these things about $7,000 coffee pots or $5,000 hammers if we bought airplanes.

I think we are going to get back to the concept of buying airplanes in some way. You don't like it. You are going to get some F-20's this year whether you like it or not. They will either go to the Guard, Reserve or Air Force, but they are going to be bought because we want to encourage that kind of free enterprise initiative to come forward with a plane that works.

If you can tell us it doesn't work, that is another matter, but I have yet to have an Air Force officer or DOD respresentative tell me that the F-20 was defective in anything they say it will do.

None of us are shilling for any particular company. We like the concept of returning to the idea of buying an airplane.

F-16 COMPETITION

Dr. **Cooper**. If I could refresh the committee's memory of when we bought the F-16, if you will recall, we had the YF-16 and YF-17. In that particular program we did have a head-to-head competition, that was the light weight fighter competition.

So, the F-16 was chosen out of that competition. Unfortunately, with production rates as they are, once you choose an aircraft and you start to procure it, economically if the production rates aren't high enough, it does not make sense to split the buy between the two contractors because of your nonrecurring cost.

Senator **Stevens**. Is the F-16 you wanted to by the F-16 you competed and indicated you would buy?

Dr. **Cooper**. No, sir.

PROCURE TO MODIFY

Senator **Stevens**. That is the point. You just award the contract to go out and modify it and change it. That is why the cost graph goes up.

The F-20 when it comes in will not be modified. If you buy it, you buy what they have done unless you tell us it cannot meet your goals.

Mr. **Cooper**. Can I discuss this more?

Senator **Stevens**. We will have another hearing because of the CBO's recommendation which are a cue as far as this committee is concerned in terms of this problem of where we are going with the buck.

My friend, Senator Rudman, is a pilot. He is a lot younger and smarter than I am. He will push it further than I will.

F-16/F-20 COMPARABILITY

Dr. **Cooper**. We are not averse to being pushed on competition. The F-20 we are talking about, and I think the contractor himself will admit it, is not comparable to the F-16 C and D.

General Russ was making the point that if you want to bring that capability up to where it is comparable, that is put AMRAAM on it, put on all the capabilities of the F-16 C and D, then that is a different aircraft.

We are not averse to that. I want the record to show we are not adverse to competition. I like the leverage we are getting out of it.

Senator **Stevens**. Senator Rudman.

Senator **Rudman**. Mr. Chairman, I know how we can settle this. Take the chief executive officer of Northrop and the chief executive officer of General Dynamics, put one in the F-20 and one in the F-16, load them up with Sidewinders and send them over the desert. Whoever gets shot down loses. [Laughter.]

Let me talk about the F-16's instead of the F-20's.

F-16 SAR

The SAR, selected acquisition reports, are very interesting reading. You may recall Senator Nunn and I a couple years ago asked for them to be furnished to Congress in a particular way. We do get them. You should be happy to know, with all the work you do preparing them, that we actually read them.

Looking at the SAR on December 30, 1984, your plans at that time were $56.8 billion for 2,795 F-16's. That is what the SAR said at that time. That was made public and I have looked at it.

Three months earlier, the same report estimated the total F-16 program cost at $49.9 billion.

I wonder if you might comment on that.

COST GROWTH

I get the feeling that, modifications and improvements aside, there has been some cost growth in this program, something greater than I think you originally anticipated. This is a wholly separate issue from whether we ought to buy F-16's or F-20's.

Dr. COOPER. Over the last year the cost of the F-16 C and D has gone down. I think there is a favorable trend there. I believe part of the issue with the SAR, and I will have to clarify this for the record, is as you march forward each year you pick up another year of buy.

We have added more aircraft to the program. So, I don't believe we are comparing apples to apples when you are comparing $49 billion with $56 billion. I think it is a larger aircraft buy. I may be wrong, but I think that is part of the cost growth.

We are making some improvements to it in terms of mods. That would cause part of it to go up.

Senator RUDMAN. I have the figures in front of me. Yes, there were 140 more aircraft. The target price in August 1983 was $2.645 billion and it is now $3.292 billion. That is an increase of $700 million.

I would like you to answer that for the record.

Dr. COOPER. I will do that. That is not the price of the F-16.

[The information follows:]

COST OF F-16's

The total program cost for the F-16 as reported in the SAR has increased from $49.9B to $56.8B primarily as the result of two major additions to the program. These additions are the F-16F configuration scheduled for introduction in FY 89, and the addition of 144 aircraft.

The cost of these two changes (as detailed in paragraph 10 of the 31 Dec 84 SAR) totals $6.9B.

F-16 SELECTED ACQUISITION REPORT

	TY $ (BILLIONS)	AIRCRAFT
SAR, SEP 84	49.9	2651
FY 93 BUY OF 144 AIRCRAFT ADDED	+ 3.4	144
F-16F PROGRAM ADDED	+ 3.5	
HIGHER THRUST ENGINE	+ .5	
ENGINE COMPETITION REDUCTION (AFE)	- .5	
SAR, DEC 84	56.8	2795

IMPACT OF MODIFICATIONS

Senator STEVENS. The intended price that we had on multiyear procurement. The difference is that the modification of the Air Force is cranked into the F-16 in the meantime.

So, the firm fixed price has gone up more than $1 billion. The chart shows there has been savings in multiyear procurement, but there is not a savings because modifications have been cranked in that have increased the cost.

I am not arguing. We can hardly say there has been a saving when the price continues to go up.

Dr. **Cooper**. You are right, Senator, the cost of F-16C and F-16D aircraft is vastly different than the cost of the F-16A and F-16B. Tht cost has gone up over the last year, and I will furnish that for the record. our estimated cost for the F-16 C-D aircraft has gone down slightly.

We have a chart we could show you that describes the difference between procuring on a multi-year basis and annual basis. If you buy 180 F-16's this year on a multiyear basis, I believe we pay 20.1 million a copy. That is for a total buy of 720.

If you do that on an annual basis, we pay $20.6 billion a copy. [The information follows:]

Cost of a C-D Aircraft

Following is a track of the F-16 FY82-85 multiyear contract price:

[In millions of dollars]

	Amount
Original contract value (480 aircraft)	$2.66
Additions to the contract	+.75
54 USAF aircraft	.26
40 Egyptian aircraft	.17
14 avionics intermediate shops	.17
Support and training equipment	.15
Present contract value	3.41

As shown above, the increase in contract value does not reflect cost growth but is the result of additional effort added to the contract.

These efforts could have been procured on separate contracts but were added to the multiyear contract as a matter of administrative convenience. The 54 USAF aircraft were annual buys of additional aircraft as the result of FY Congressional budgt action, and the $0.17 billion for 40 Egyptian aircraft are Egyptian funds. The procurement of avionics intermediate shops and the support and training equipment were efforts originally budgeted for but not negotiated with the original multiyear contract. These are separately defined efforts and do not represent a cost increase for work previously negotiated.

Comparing the average unit cost for 720 aircraft over the second multiyear period shows an estimated savings of $360M.

[In millions of dollars]

Average unit cost for 720 aircraft (fiscal year 1986-89):	
Multiyear procurement	$20.1
Annual procurement	20.6

AIRPLANE PURCHASE MODIFICATIONS

Senator **Stevens**. Mr. Secretary, the difference is that you didn't buy the same airplane on a multiyear basis. You modified it three times.

Dr. **Cooper**. Yes, sir, we have modified it.

Senator **Stevens**. So that the savings that were projected to us by a multiyear buy are not there because you are not buying the same airplane each year.

Now, we are going to go into this in depth because that saving we thought would be achieved is not being achieved. The Senator is right on point. He is ahead of me.

Senator **Rudman**. I am not ahead of the chairman on anything. I do have a problem looking at some of the numbers on these things because they are hard to track. It is a little like going into a garage, you are going to buy cars X and Y. The fellow says, "I am going to deliver those to you for $19,000 each."

Along the way they keep adding modifications. Before you know it, the car costs you $24,000. I suppose you could say originally it was cheaper.

F-20

I have problems with the F-11. Let me move from there to the F-20 briefly.

I have heard all these numbers. I don't think anybody really knows what the numbers are. We have had more propaganda on these two aircraft sent to our office. You know, we have to have separate file drawers for them.

Nonetheless, I think everybody now has more or less come to the conclusion that there are minor variances in performance. One has greater sustained turn rate and another a better instantaneous rate, one scrambles faster, one scrambles slower, one has somewhat more sustainability, one less.

F-20 IN AIR DEFENSE ROLE

I generally get an understanding from Air Force people I talk to that in terms of the mission in air defense in particular the F-20 is a pretty good airplane. Nobody is really arguing that there is a great similarity in the performance of the two aircraft.

General **Russ**. I think the F-20 is an excellent airplane. I have always said that. The F-20 is just like the F-16. When the first F-20's come out, they didn't have a high class radar on them. They have since been improved and now they have an all-weather radar on them that is as good as the F-16 radar. It is a matter of what you put into that airplane to do the mission you need to do.

I have several friends that have flown the F-20. They have very high praise for the airplane. It is an excellent airplane. That is why we are thinking about buying it.

LOGISTICS IMPLICATIONS

Senator **Rudman**. I think you answered the questions by Senator Proxmire and Senator Stevens very accurately. You are concerned about the logistics train of setting up a separate line of aircraft. I understand that.

We beat you around the head and shoulders about the logistics cost. We don't want to impose something that will increase the overhead cost even greater.

I submit to you that there may be a way to do this as you are replacing the F-4 fleet in particular. We look at a total force, Air Guard, Air Reserve, vital parts of the Active Forces in terms of combat. Nevertheless, in terms of logistics train, they tend to be somewhat separate from the Guard in terms of location, maintenance, and so forth.

Am I correct?

Dr. COOPER. They are still at the depot level. They rely on our depot support.

Senator RUDMAN. I hope that the Secretary himself will look very closely and decide what those base costs are going to be. I have to tell you, and this is not in any way offensive to the supplier of F-16 aircraft, but they have not had the best track record in a variety of other areas that have to do with the Department of Defense over the past couple of years.

DOD IG REPORT

As a matter of fact, looking at some of the news reports of the Inspector General of the Department of Defense this morning, you might say that they are in mild disrepute with some sectors of DOD.

Having said that, it certainly would seem that we ought not to continue to reward them if there is a good viable alternative that gives us competition and lower prices. That may not be a factor in your consideration when buying aircraft, but I tell you it gets to be a factor in Congress when we start looking at the amount of money we give to the various defense contractors.

I don't think you necessarily reward misconduct. I think the supplier of F-16's as a corporate entity has been guilty of misconduct. There is no question about that. I hope you look at it very closely.

Dr. COOPER. Sir, on the point of competition, let me say that you and my boss, Secretary Orr, are in agreement on that point.

Senator RUDMAN. I am sure we are. I agree with him completely.

RELIABILITY AND MAINTAINABILITY INITIATIVE 2000

Let me turn to something that I favor strongly, your reliability and maintainability initiative 2000, as you call it. My understanding is that that is a new edict in the Air Force to try to put reliability and maintainability on the same general level of the other factors we have looked at, cost, performance, and so forth.

Obviously, you tend to have a linkage between them. At what point will this organization go to the Secretary, to the command level in the Air Force, and say we don't think that any further investment in program X, Y, or Z ought to be made because we believe that under the criteria that we are charged with looking at, it cannot meet the test?

At what point will that be done?

Obviously, I am questioning how much money do we have to spend before we have to say we will not go beyond that?

DESIGN R&M

Dr. COOPER. Let me make a comment and then I will turn it over to General Russ because he has been working very actively on the place where I see the biggest role for our new R&M advocate, General Goodell—that is in the front end of the process, in the design phase.

You have to design in reliability and maintainability. We band-aid those systems already down the pike that have not had R&M

designed in to the extent we would like to see it. We will continue to try to do that.

If you are talking about impacting reliability and maintainability long-term, you have to do it on the design work. Frankly, I don't think we have done as good a job in the Air Force as we should have in that area. I think many times we start out trying to design it in, but when we run into a crunch in terms of cost, performance or schedule, many times it has been R&M that suffered.

That has been the thing that has gone by the wayside. We want them to get in early on in our source selection. That is one of our top criteria—when the manufacturers come in—we want to see what their R&M plan is.

PRODUCTION HOLD UP

Senator RUDMAN. You are holding up production, as I understand it, on the ALR-74 radar warning system.

Dr. COOPER. That is right.

Senator RUDMAN. You are reviewing the LANTIRN program and you are taking a look up front at reliability and maintainability and saying further investment is not necessary?

Dr. COOPER. Maybe it is necessary. Sometimes we can't measure it in the development phase—some of these things we can measure in the development phase—some of the R&M phase you can't measure until you get into production and get some units in the field.

WARRANTIES

Those we can't measure, we would like to cover with a warranty. We will try to do that with the C-17. We are being very hard on the C-17 in terms of R&M. There are things we can't measure in the development phase. Until we get operational experience, we won't know whether the R&M goals are being met. Those phases we want covered by the warranty.

Senator RUDMAN. I don't want to take any more time unless General Russ wants to add on to that at all.

General RUSS. You said when do these people get involved. The point is that they are involved today.

In fact, they were a prime consideration in our not making a decision to proceed with the ALR-74 system you brought up because it just would not meet the requirements we set down for the reliability and maintainability.

We are not going to buy something and put it in the inventory if it does not work. What we have told the contractors and told everyone else that will listen is that I would just as soon send a fighter pilot off with no system than with one that he has about a 50-percent chance of working. This is because if he has no system in the airplane, at least he knows where he is.

If he has a 50-percent chance that it is working, he won't know whether the system is working or not and he is liable to do something depending on the system and end up getting shot down. So, if he does not have it, at least he knows what he is doing.

R&M 2000

Senator **Rudman**. Mr. Chairman, I think this is one of the best initiatives the Air Force has taken, this so-called Project 2000, R&M 2000, designed specifically to have an early warning system to determine whether or not some of these expensive programs ought to be killed early on.

I submit to you if the Army had had an R&M 2000 office in place 5 years ago, we would not have the problem with Divad we have today. We would not even make the Divad which I don't call the Sergeant York. I refer to it as Sergeant Bilco.

CULTURAL SHOCK

Dr. **Cooper**. I appreciate your comments on R&M. This is not going to be an easy thing to do. This is a cultural shock for our system. This edict came from on high. It did not come out of the bowels of the Air Force. It came direct from the Secretary of the Air Force and General Gabriel.

It will take a lot of effort to press this down. We are going to have to have a lot of stick-to-it-iveness because General Russ and I are both committed to it and General Gabriel and Secretary Orr are both committed to it.

At some point in the future we all will be gone to do other things. Therefore we need to push this thing. What is very important is that we need to send a signal to industry that we are serious about it. They need to see a carrot at the end of that stick.

I still think many people in the industry say we know what you are saying, but when push comes to shove, you really are going for that last increment of performance. We have to show them with our action that we are serious.

R&M REWARDS

You will see source selections in the not too distant future where R&M will be rewarded. We have to continue to do that over a period of years until it becomes institutionalized and R&M becomes the fourth leg on the stool along with cost and performance.

It is not an easy task. We appreciate your support in bringing it out.

Senator **Rudman**. Let me say that I agree we have a culture shock in the Air Force and some of your contractors will get a lot more culture shock from Congress unless all the Services start doing this.

Thank you.

Senator **Stevens**. Thank you.

The next person in the room is Senator D'Amato.

COST AND PERFORMANCE RELIABILITY

I will only add I think you have taken a tremendous step in the last year. We are delighted to see you are starting to get some semblance of long-term consideration of cost and performance reliability, and the warranty concept that Senator Andrews has started to perk through this whole system.

Senator **D'Amato**. Thank you very much, Mr. Chairman.

BOMB RACKS

In February 1984, General Kelly, vice commander of the Tactical Air Command, chaired a meeting attended by the Air Force systems cost growth managers, I think General Russ should be familiar with that, for the purpose of establishing new specifications to improve present MAU-12 bomb racks on the F-16, F-15E and F-16F aircraft.

SPECIFICATIONS

The Air Force collected substantial data on the deficiencies of the MAU-12 bomb racks over a period of several years and developed detailed specifications to improve the ejector units.

General Kelley in the meeting reviewed and approved the specifications which were then formalized in a statement of need for a matched pair of ejector units to satisfy both Air Force and NATO requirements.

When it gets down to the basics, there are examples of semiautomatic sway braces, radar cross-section image improvements that diluted the specifications and rather modest cost savings, these were all thrown out.

We are concerned why, what about the vulnerability of the present system? Are we going to continue to use an outmoded system which makes the aircraft vulnerable?

Is it not true it is vulnerable in terms of enemy radar? Is it not true in terms of bomb loading specifications, you can't even begin to compare the two, the old system with the new system?

PROTECTING DEVELOPER

What is going on? Are we so interested in protecting one developer of this that we are going to keep out, we are going to throw out 2 years of work, we are going to throw out a system where it says one is much more effective, one is safer, so that we can keep one person producing it?

I would like to know.

Dr. **Cooper**. Senator, let me ask General Monahan to respond to this, because he has been working on this issue.

Senator **D'Amato**. I want to tell you something. It is not because I sent a letter, you know that, I didn't blind-side you with this. I sent a letter to Secretary Orr about this.

I have a constituent, EDO Corp., that makes the bomb racks. You are going to keep using the old system because you want to protect one contractor that is the only reason you are doing this, when the bombs can be loaded 46 minutes manually now as compared to 20-some-odd seconds?

LIFE CYCLE COST

What about the cost of the life cycle? What about jeopardizing men up there with a system that is detectable by enemy radar?

You studied the thing 2 years. What happens? You get pressure from someone in the Congress and you throw that out.

That is nonsense. Let us hear why you did it.

General **Monahan**. I will be happy to talk about that, Senator.

Senator **Stevens**. Give your name for the record.

General **Monahan**. General Monahan.

MIL STANDARD

We developed a new Mil Standard (MIL STD 2088). We are using that Mil Standard. We have tailored it as necessary as we procure ejector units for bomb racks.

In the case of the F-15E, for example, some of the stores stations on the airplane require the full Mil Standard of the 2088 ejector unit. We plan to procure that type for those store stations.

For other store stations on the airplane it is not necessary to buy the full Mil Standard 2088. So, we are looking at two different solutions as far as the F-15E is concerned.

TURNAROUND TIME

One incorporates the full Mil Standard. The other has reduced Mil Standard. One, however, is still meeting all our requirements for turnaround time. Our standard on the F-15 is 45 minutes to turn the airplane around, completely refuel it, rearm it, get it back ready to go, whichever way we go, either with the old MAU-12 system——

Senator **D'Amato**. What about the old MAU system? You load the bombs in manually?

General **Monahan**. Yes.

Senator **Stevens**. Senator, will you yield for a minute?

[Off the record.]

General **Monahan**. I would like to pick up where I left off, Mr. Chairman.

For example, our turnaround time requirement for an F-15 is 45 minutes at the present time, and even with the old style non-Mil Standard ejector units, we can do that in about 27 or 29 minutes. By going to the new type of ejector unit, we only improve that by 1 minute or so.

So, it is not a driving factor as far as that requirement is concerned.

Senator **D'Amato**. That is nonsense and you know it. That is an attempt to cover up for keeping an old, ineffective system that is vulnerable to enemy radar that you can't even compare.

OPERATIONAL TEST AND EVALUATION

Did you make any operational test and evaluation to measure the aircraft turnaround time?

We are talking about those bomb racks in the conditions of cold, bad weather, night operation, by any standard. Did we do that?

General **Monahan**. We have an awful lot of experience under all those conditions.

Senator **D'Amato**. Did you make any test and compare them under those standards.

General **Monahan**. We have not even developed the new Mil Standard ejector unit yet.

Senator **D'Amato**. There is no Mil Standard needed to find out how long it takes under the conditions of cold water, bad weather and night operation.

Did you compare the two? Did you run a test?

General **Monahan**. We can't run a test when we do not have the new system built.

WESTERN GEAR

Senator **D'Amato**. After 2 years of exhaustive study, everybody recommends this and you scrap it. You mean you did not scrap it because you wanted Western Gear to continue to manufacture it and nobody else to come in?

General **Monahan**. We really don't care who manufactures it.

Senator **D'Amato**. Somebody did.

General **Monahan**. We do care about competition.

Senator **D'Amato**. Nonsense. For the record, for the record, nonsense. For the record, nonsense, absolute nonsense.

General Russ, you are familiar with this incident, are you not?

General **Russ**. Yes, sir.

Senator **Stevens**. Senator, with due respect to my great friend, let us let these people answer the questions that are asked.

Senator **D'Amato**. When I get back from General Monahan that kind of response, I have to say absolutely unacceptable. I can't believe it. It is not believable.

MIL STANDARD 2088

General **Monahan**. If I may reiterate, we have not scrapped the new Mil Standard 2088. We are going to apply that on certain store stations on the F-15E. If we have to apply it on the others, we will.

We do not, however, want to over specify. There are certain store stations on an airplane where we may not have to buy the Cadillac when a Chevrolet will do. We are competing both modes at the present time.

AIRCRAFT VULNERABILITY

Senator **D'Amato**. Let me ask you something.

Aren't you concerned about the vulnerability of that cross section of the present system and one you are going to continue with respect to radar?

General **Monahan**. Concerning the radar cross section issue, first of all, between the Mil Standard and the non-Mil Standard, there is a minor difference in radar cross section.

The thing that really drives radar cross section is the overall size of the airplane. The contribution of the ejector unit to that is very, very small. It is not a driver.

BUSINESS AS USUAL

Senator **D'Amato**. After 2 years of General Kelley's review you have decided you will continue the business as usual?

General **Monahan**. No, sir, we are not going to procure the old style ejector unit. We are going to procure either a new one, either complete Mil Standard or a reduction to that Mil Standard, minor reduction, whichever is cheaper and provides the required performance.

OPERATION AND MAINTENANCE

Senator D'Amato. Are you going to have now two sets of parts, two sets of inventories, two sets of training in terms of your maintenance and operation?

General Monahan. That is possible, but we, first of all, look at that in a formal source selection where we can carefully evaluate all the life cycle cost factors. Whichever one comes out cheaper, that is the one we will go to.

Senator D'Amato. You have not made that test. You will just continue putting that gear in there, that old system?

General Monahan. No, we are not going to put the old gear in there. That is rejected. We will go in with the new gear.

LOADING TIME

Senator D'Amato. How long does it take this new one to load a bomb, how many minutes?

General Monahan. I don't know the numbers right here.

Senator D'Amato. General Russ, do you know?

General Russ. No. The standard is 45 minutes. The point is when you turn an aircraft around you have to refuel it, put in oxygen, load bombs, put ammo in, you have to do a lot of things. That is why we established 45 minutes turnaround time.

General Monahan is saying while one may be a few minutes faster than the other——

Senator D'Amato. How about 20 times faster, which doesn't involve somebody with a manual operation at night, wind, cold?

OLD TECHNOLOGY

Are we really going to say that we are going to use the technology of the old? Why is it? You are going to tell me if you are going to improve something about 20 times; is that not substantial?

General Russ. I did not say that. What I said was that the turnaround requirement for the Air Force is 45 minutes. What I said was that it was combined with a series of things you had to do.

Therefore, it is still going to take us 20 to 30 minutes to turn a plane around to put fuel in it, oxygen, to do those other things.

TURNAROUND LIMIT

Senator D'Amato. What is the outside limit of the turnaround of these planes? What creates the longer period of time?

Senator Stevens. Gentlemen, with the understanding we will be out of here at 11:45, you have 1 more minute.

Senator D'Amato. What is the outer limit of time loading the bombs, fuel? What is it?

General Russ. I think fuel is the outer limit. It depends on what type or ordnance you are loading. If you are loading air to air in addition to air to ground, that is one sort of time frame. If you are doing just bomb loading, that is something else again.

I can't give you a set time on each load. That is why we established a set 45 minutes and all our war plans are based on turning them around in 45 minutes.

PROTECTING A SOURCE

Senator **D'Amato**. I can't believe you did all this work and got it held up simply—I do believe it—because you can have an old interior, have the same source, you are shaking your head.

Whether this was a constitutent of mine or not—it happens to be—I think it is abhorrent. That flies in the face of what you are talking about and you, Mr. Secretary, talked about, using better, safer, you are talking about $30 million planes up there.

You talk about vulnerability. You are talking about doing things better. I just think this is a poor example and it is an example of protecting a source. It should not be done.

General **Monahan**. We are not the least interested in protecting source.

Senator **D'Amato**. Somebody is.

Senator **Stevens**. That has to be it.

Senator Sasser.

Senator **Sasser**. Thank you, Mr. Chairman.

COMPETITION

I wish to support the observations of the Chairman made relative to encouraging competition with regard to various weapon systems and various aircraft with procurement costs going up.

Certainly it appears to me that encouraging competition and the development of various weapons systems is one way to perhaps get some sort of handle on this procurement cost and also to get away from the micromanagement.

I think that goes on with regard to development of many of these weapon systems leading to the ultimate procurement. I can understand why that comes about to a large extent. But I think we might look very carefully at getting away from that concept.

C-5A COFFEE MAKER

The chairman brought up the question of the expensive coffee maker in the C-5A. I am told by the manufacturers of that aircraft that they wanted to put in the regular commercial coffee maker, but the Air Force wanted a special coffee maker and the result was that there was greatly increased cost.

You don't have to respond to that.

Dr. **Cooper**. I would like to. I think it is the opposite. The C-5 was bought under a total package procurement. The Air Force did exactly as you were suggesting at the time and not trying to micromanage that program.

REPLACEMENT SPARES

You brought up that example. As a result, we didn't have the insight into many of the components that went into the C-5A when it was initially procured. Where the coffee pot price issue came in is when we went to buy replacement spares later on in the cycle.

Then we started to discover some of the prices of components in that particular aircraft.

That is the down side of not having insight into what goes on in the development. There is some up side to that as well. In that particular case I think it is the opposite of what you are suggesting that we didn't have insight into what was going into the C-5A.

Senator **SASSER**. Lockheed is the one that foisted off this expensive coffee pot on you?

Dr. **COOPER**. It was part of the total package of procurement.

Senator **SASSER**. If they try to point the finger at the Air Force and say, look, we designed and put in the coffee pot that the Air Force wanted, they are incorrect?

Dr. **COOPER**. I will let General Russ address that, but Senator Rudman was talking about the initiative we have in the R&M area.

OVERSPECIFICATION

We have also an initiative underway in the overspecification area. Our sensitivity has been heightened because of coffee pots and toilet stools. We want to make sure we are not overspecking.

One of the things General Russ looked at was the C-5A.

General **RUSS**. We looked at that specifically to determine what our problem was on overspecifications. Why should you have a coffee pot such as the one in the C-5?

The way it is specked means the coffee pot will operate at 50,000 feet while the airplane won't go to 50,000 feet. There are a lot of different things involved.

Senator **SASSER**. Johnny Carson said it will even operate after a crash, so you don't have to send out for coffee.

BAD RAP

General **RUSS**. To be perfectly frank, that is kind of a bad rap. We went through and looked at the C-5 to see where there were areas of overspecification.

As an example, you heard about the thing that said it should withstand 20 G's within 11 point milliseconds.

People don't understand that that is not G's like you and I know, pulling airplane G's. It is impact G's. You could drop that coffee pot. If it fell out of somebody's hands when he was going to get it fixed, he could drop it on dirt from about 6 to 8 inches. That is the type of thing.

That was not an overspec. But there are lots of overspects in there.

What the committee that I put together did was to go through and say why do we have these overspecs? What is the problem?

PROBLEMS

We found three areas.

First, in the requirement definition.

Senator **SASSER**. This is the C-5?

General **RUSS**. We used the C-5 as a particular study, but our findings should apply across the board to any sort of new system.

We found first there is a tendency at times to overspec the requirement. Say that you want to go 2.5 mach and you can go 2.48 mach at a certain price, but you pay a tremendous penalty to go that last two-tenths of a mach. We said be careful of overspecking. Maybe 2.48 mach is good enough.

The second thing, there is a series of documents called general mil specifications, some 4,000, that lay down all of these various parameters against which you should test your program.

SPECIFICATION REVIEW

What happens is that those specifications need to be reviewed and they need to be tailored for the specific thing you are talking about. If you apply blanket specifications to everything you buy, it is kind of belt and suspenders for everything.

Senator **STEVENS**. May I ask one question right there?

General **RUSS**. Yes, Mr. Chairman.

I only have 6 minutes.

G FORCES

Senator **STEVENS**. I want to get a clarification.

Did you say the six G thing about surviving a drop of 5 feet or 4 feet?

Dr. **COOPER**. If I were to drop this pencil like that, that is 20 G's impact instantaneous.

Senator **STEVENS**. That is not what the spec says.

General **RUSS**. It is interpretation of the people who didn't understand what the spec meant, they read the articles in the newspaper which were incorrect and so forth.

RADIAL VERSUS IMPACT G'S

The G's we are talking about are not radial G's you get in the airplane. They are impact G's. That means it drops and it won't crash and break apart.

I was trying to make a point. The point is that there are a lot of things that are overspecked. We are trying to make sure that we attack that problem. The generic part of that problem is the requirement process and in tailoring and detiering these specifications so that we don't apply blanket specifications to something that doesn't need it.

Senator **SASSER**. Thank you, General Russ.

I don't have much time and I have a lot of questions about a lot of subjects I would like to ask you. I do need to move quickly on the ones I do have.

Senator **CHILES**. May I make one quick statement?

I just want to say I go along with the suggestion we ought to have some competition in the fighter program.

B-1

Senator **SASSER**. Gentlemen, I have supported the B-1 bomber program since it came before the Senate as long as I have been here. I was interested to see that the current issue of Defense

Week includes a story entitled "Hill Staff Frustrates Air Force Contract Award on B-1."

Now, this story indicates—Secretary Cooper is familiar with that—the story indicates that the Air Force has concluded competition for heavy duty weapons loader for the B-1 and after making a selection of the contractor, the Air Force requested a reprogramming before the appropriate congressional committee to provide for the procurement.

I am not going to ask our chairman today if we received a reprogramming request. I will ask the staff perhaps a little later.

The Defense Week article indicates the program has been held up by the House committee.

What is the status of that reprogramming?

WEAPONS LOADER

Mr. COOPER. I have a passing interest in that. We did have competition. We were directed by the Congress to have a competition and our competition format was approved. We had a competition for a new simplified loader for the B-1. We are going to buy 90.

The loader we had been using for the B-52 has been modified; it is an improved version. After selecting the winner from the competition, and there were three bidders for a simplified trailer, we compared it with the old trailer in terms of cost, performance, logistics, and supportability.

SOURCE SELECTION

The new trailer was 40 percent less costly. I concluded—I was the selection authority—that in terms of performance, logistics, supportability and schedule, all the elements, it was a push between the two. It really came down to a cost differential. It was not even close in cost.

The contractor bid a firm fixed-price contract. My decision was to go with the new loader. That necessitated that we devote $6.8 million in R&D funds. We came over in December with a letter to the committees indicating what our choice was. We were directed by the law to do that.

REPROGRAM REQUEST

We indicated it was our desire to reprogram $3.8 million to get started. All three committees, with the exception of the House Armed Services Committee, approved that or at least didn't object to it.

So, we took that as approval, but a hold was put on our contract by the House Armed Services Committee pending our providing them with further justification. It has been 4 months. We had a hearing last week on the issue, a fairly lengthy hearing. We are talking about a total of $30 million.

HEARING

We had a full day hearing. I testified for 2 hours. At the end of that we just had to agree to disagree.

There are a couple of people on the Armed Services Committee that think we should stay with the old trailer. I don't know how we stay with the old trailer, given we have had competition. We have played between the foul lines.

Everybody had an opportunity to bid. When you lay out the entire source selection for the committee, I don't see how I have any other alternative but to select the guy who is the low bidder in that he meets the cost performance, schedule, and affordability criteria.

COST SAVING

Senator **Sasser**. I understand that the cost of the loader that was selected was $27.7 million versus the cost of the loader that came in second at $39.9 million?

Dr. **Cooper**. That is correct.

Senator **Sasser**. So, there has been a cost saving there?

Dr. **Cooper**. Actually the cost of the loader, if you look at the acquisition cost, the simplified loader, was $21 million. There is a $6 million R&D bill that goes along with it. If you look at acquisition cost, it is $27 to $39 million.

LIFE CYCLE COST

The other issue was life cycle cost.

Senator **Sasser**. You have 36 percent savings in life cycle cost.

Dr. **Cooper**. It is difficult to judge what the 15-year life cycle costs are going to be. We have had a number of estimates that range from the push to the number you indicate. It really boils down to the difference in acquisition cost, which is a very significant difference.

FURTHER HEARING

Senator **Stevens**. Senator, I am going to have to indicate to you that we will have a further hearing. I promise you that you will be recognized first if you are at the hearing.

I hope you will join me now in saying that we should recess the hearing in deference to our late friend who has been before this committee.

HH-60A

I would like to put in the record a request from Senator Weicker concerning the HH-60A aircraft and I draw your attention to that since you might run into that in the next installment of this hearing.

[The information follows:]

United States Senate
WASHINGTON, D.C. 20510

April 24, 1985

The Honorable Ted Stevens
Chairman
Subcommittee on Defense
Washington, D.C. 20510

Dear Mr. Chairman:

In anticipation of the upcoming hearing before the Defense Subcommittee on Air Force modernization programs, I would like to offer a proposal on the HH-60A helicopter program for your consideration.

As you may know, the Air Force is planning to buy 90 HH-60A helicopters over the next four years for the combat rescue mission. I do not question the need for these aircraft, but I take issue with the plan to fill them with 1600 pounds of costly and unnecessary electronics -- equipment that will drive the unit cost of these aircraft from $6.0 million to $10-15 million. The Navy, by comparison, is buying a modified H-60 helicopter for the same, identical mission--combat rescue--but at a much lower cost, $6.0 million.

I am recommending that we direct the Air Force to take the Navy approach and buy a more austere combat rescue aircraft without all the electronics. My proposal would save about $85 million in fiscal year 1986 and in excess of $500 million in fiscal years 1986-89.

I would like you to ask your staff to review my proposal and the reasoning behind it as outlined in the attached issue paper. I would also like to request that you make my proposal a part of the record of the hearing scheduled for April 25th, so that the Air Force will have an opportunity to review it and comment on it in a formal way if desired.

I look forward to having your thoughts on my proposal. Your continued cooperation and support in these matters is appreciated.

Sincerely,

Lowell Weicker, Jr.
United States Senator

LW/chm
Enclosure

AIR FORCE HH-60A NIGHT HAWK HELICOPTER PROGRAM

MISSION

- The Air Force is planning to buy 90 HH-60A Night Hawk helicopters over the next four years, fiscal years 1986-89, for the combat rescue mission. The combat rescue mission is extremely difficult and hazardous. Such a mission could be 4 to 8 hours in duration and could take these aircraft far behind enemy lines to rescue downed airmen.

PROGRAM COST

- Excluding the radar, the total cost of the HH-60A program is expected to be $1.2 billion or $13.7 million per aircraft.
- The fiscal year 1986 request is $122.1 million for production of the first three aircraft and advance funding for 25 additional aircraft in fiscal year 1987.
- Additional R&D funding is requested for flight testing and continued development of the radar.

The HH-60A would be a derivative of the Army UH-60A Black Hawk but will cost two to three times as much -- $5.0 million versus $10-15 million.

- The main reason why the HH-60A would cost so much more than the UH-60A is the 1600 pounds of electronic or avionic equipment to be installed in the aircraft to provide a capability to operate at night and under adverse weather conditions. At roughly $2500 per pound, the avionics equipment will add a minimum of $4.0 million to the cost of each aircraft and up to $5.0 million per aircraft with the radar.

PRINCIPAL CONSIDERATIONS

- The HH-60A was originally designed to perform two missions: combat rescue and special operations. However, as a result of a 1984 Department of Defense decision, the Army is to assume primary responsibility for the helicopter portion of the special operations mission, relieving the Air Force of those responsibilities. The HH-60A avionics equipment package was never modified to reflect that decision and the resulting changes in mission requirements.
- The Army is considering a plan to modify a small number of UH-60A aircraft for special operations by equipping these aircraft with an avionics system comparable to the one planned for the HH-60A.
- The Air Force bought 11 UH-60As in fiscal years 1981-82 at a cost of about $5.0 million each and has assigned 9 of them to the 55th Aerospace Rescue and Recovery squadron at Eglin AFB, Fla. for the combat rescue mission.
- The Navy bought two modified UH-60As in fiscal year 1985 at a cost of $6.0 each and will assign them to its combat rescue squadron -- HC-9-- at NAS North Island, Calif. The Navy plans to buy more of these aircraft in the near future.
- The UH-60A is capable of performing the combat rescue mission for both the Navy and the Air Force.
- With the external stores system -- known as ESSS, which was developed by the Army and which consists of a pair of racks capable of carrying up to four external fuel tanks, the

unrefueled range of the UH-60A will be extended from 350 nautical miles to 1200 nautical miles.

- An unrefueled range of 1200 nautical miles would satisfy the combat rescue requirements of both the Air Force and Navy.
- Our experience in Southeast Asia suggests that aircrew recovery rates were low when enemy opposition was encountered. For example, for the 27 successful Navy rescues in North Vietnam, the Navy lost 19 aircraft and 15 rescue personnel.
- In order to survive in the next war, helicopters must be able to operate at night.
- The UH-60A, when piloted by crews equipped with night vision goggles, is capable of performing the full range of night operations. About 30-40% of all UH-60A flying hours are flown at night.
- The probability of successfully completing a long-range, low-level helicopter rescue mission at night and in bad weather is poor. The Air Force has never mastered low-level flight in bad weather with fighter aircraft.
- The Air Force has a small fleet of HH-53H helicopters that are equipped to fly low-level missions at night and in bad weather. However, these aircraft never practice low-level flight in bad weather because it is simply too dangerous.

RECOMMENDATIONS

- Direct the Air Force to procure a more austere version of the HH-60A -- one comparable to the aircraft the Navy is buying for the same mission and one whose cost must not exceed $6.0 million in fiscal year 1985 dollars. Toward that end, we should provide about $35.0 million to procure three aircraft in fiscal year 1986, including initial spares and advance procurement for 25 such aircraft in fiscal year 1987. This would save about $85.0 million in fiscal year 1986 and in excess of $500 million for fiscal years 1986-89.
- Direct the Army to modify a small number of UH-60As with advanced avionics needed to perform the special operations mission.

SUBMITTED QUESTIONS

Senator STEVENS. There are also some additional questions from members.

[The following questions were not asked at the hearing, but were submitted to the Department for response to the hearing:]

ADDITIONAL COMMITTEE QUESTIONS

TARGETING POD FOR LANTIRN SYSTEM

QUESTION: Secretary Cooper, thus far the testing program for the LANTIRN night attack system has had mixed results. The test effort for the navigation pod has been highly successful with over 400 sorties already having been accomplished. However, the targeting pod, which is at least a year behind the navigation pod, had to be completely refurbished and only 40 sorties have been flown since December.

What have been the technical problems with the targeting pod, and has it resulted in any cost growth in the program?

ANSWER: Targeting pod testing started in October 1983. As of 30 March 1985, the Targeting pod subsystem had accumulated 140 sorties and 203 operating hours. The Targeting pod did not mature as fast as the Navigation Pod, and the Air Force restructured the LANTIRN program in August 1984 to accommodate a split Navigation and Targeting pod production decision. More specifically, problems were encountered in the Forward Looking Infrared (FLIR) detector/FLIR cooler reliability area, electro-mechanical interfaces in the nose section (cooling fluid leaks), laser power supply reliability, and lack of tracker tenacity (caused by noisy FLIR video signal). The Targeting pods were refurbished in the August-November 1984 time period; new Forward Looking Infrared (FLIR) detectors with coolers, improved tracker software, and improved recoated optics were installed along with vibration damping materiel. Since the restart of the DT&E at Edwards AFB in December 1984, the Targeting pods have accumulated 65 sorties. The pilots have noted an improved FLIR picture and tracker performance. The system has achieved "lock on" on the Edwards' test center infrared target board at 15-18 Nautical Miles (NM) and "lock on" on tactical vehicles at 3.5-4.5 NM. Over 250 LANTIRN and infrared Maverick missile correlations have also been demonstrated along with laser ranging and designation. The overall test results have been very encouraging.

The Targeting pod production delay has had no cost impact on the firm-fixed price RDT&E contract. The cost impact to the production program is an increase of $94M (then year dollars) over the eight year production run. This cost increase is due to outyear inflation adjustments and factory overhead costs associated with running the Targeting pod production line in 1993 after all Navigation pod deliveries have been completed in 1992. Also, the Targeting pod initial operational capability (IOC) on the F-15E aircraft is delayed one year, i.e., mid-1990 vs 1989.

QUANTITY OF POD SETS

QUESTION: Although LANTIRN is still within its funding cap, the Air Force had to reduce the quantity of pod sets to be procured from 720 to 700. Is your current program really affordable?

ANSWER: The Air Force signed a firm-fixed price (FFP) production contract for LANTIRN on 1 April 1985. The contract covers the purchase of 700 pod sets (Navigation/Targeting pods) and 29 sets of support equipment. Also contained in the contract is an extensive performance warranty. The production program is within the Air Force LANTIRN funding cap, and the program unit price has not varied by more than 10 percent since 1983. We plan to install the

LANTIRN system on 392 F-15E, 200 F-16C/D, and 100 A-10 aircraft. The remaining eight systems will be used for training and depot rotatable spare assets.

Is the program affordable? Yes. The advantages of LANTIRN are due to increasing the aircraft's effective operating window per day (European winter wartime scenario--4 to 17 hours per day); improved weapons delivery accuracies at night, comparable to accuracies achievable during the day; laser designation for single seat F-16s and A-10s; and a reduction in the number of passes needed to launch Mavericks on multiple targets. Studies indicate that LANTIRN-equipped aircraft will have a 50 percent lower attrition rate during combat missions. This increased survivability is attributed to the 200-foot nighttime ingress/egress target penetration altitudes. Additionally, because of the above mentioned expansion of the aircraft's daily operating window and lower attrition rates in combat, a LANTIRN-equipped F-15/F-16 is over three times more cost effective than the basic airframe without this system.

TERMINATION OF TARGETING POD

QUESTION: There has been discussion of termination of the Targeting pod portion of the LANTIRN program (keeping the Navigation pod), rather that cancellation of the Air Force's only night attack program if overall program costs cannot be contained.

Is this a viable option? What would the Air Force lose if the targeting pod were cancelled?

ANSWER: LANTIRN program costs are contained. The Air Force signed a firm-fixed price (FFP) contract with Martin Marietta on 1 April 1985 for the production program. The FFP contract covers 700 pod sets (Navigation and Targeting) and 29 sets of support equipment. The contract also contains a two year performance warranty. The production program is within the AF LANTIRN funding cap that was established in February 1983. The basic contract in FY 1985 is for two Navigation pods, with FFP annual options starting in FY 1986 through FY 1991 for both Navigation and Targeting pods.

The overall value of the LANTIRN system is the synergistic capability of the Navigation pod, Targeting pod, Heads-up-display and aircraft integrated as a system. Even so, each pod can be operated and employed independently. The Navigation pod provides a low altitude high speed ingress/egress capability under the weather and at night. The Targeting pod, with its forward looking infrared (FLIR) sensor, detects temperature differences with sufficient range and resolution to allow manual target acquisition and lock-on. Then another Targeting pod subsystem (Missile Boresight Correlator) provides automatic Maverick missile lock-on. This automation reduces the required workload on the pilot during the attack phase and provides weapon launches at standoff ranges. Additionally, the Targeting pod contains a laser ranger/designator. This system provides enroute course updates for more accurate navigation and gives our fighter force a self-contained laser guided bomb delivery capability.

In general terms, if the Targeting pod program were cancelled, the Navigation pod alone provides the above mentioned capability to fly and maneuver at low altitudes--at night and under the weather. It would also provide some limited capability for weapons delivery.

However, because the Navigation pod's sensor resolution is not nearly as good as the Targeting pod's, we would only be able to attack large targets (e.g., military complexes, airbases, dams, factories) using area-type munitions. Additionally, the lack of a laser designation capability provided by the Targeting pod will restrict our night attacks to overflight munitions deliveries.

LANTIRN PERFORMANCE WARRANTY

QUESTION: LANTIRN is on a firm-fixed price production contract. Does LANTIRN's contract also include a performance warranty?

ANSWER: Yes. The recently signed LANTIRN firm-fixed price contract contains a performance warranty provision in accordance with 10 USC 2403. A brief summary of the LANTIRN warranty provisions is as follows:

a. Martin Marietta Corp. (MMC) is responsible for repairing all Navigation pod and Targeting pod failures which occur during the first 24 months following formal acceptance and/or until the pod has accumulated 400 hours of operation, whichever comes first.

b. A "failure" is defined as the inability of a warranted item to perform its required functions. "Failures" include, but are not limited to:

(1) Inability of any item to meet the essential performance requirements specified in the LANTIRN production specifications.

(2) Nonconformance with respect to design (drawings and hardware) and manufacturing requirements of the contract.

(3) Defects in workmanship or materials.

c. MMC will repair warranted items at their facility in Orlando, Florida. MMC must repair or replace the item within 60 days of receipt. Any period of time exceeding 60 days during which the item has not been returned or replaced will be excluded for purposes of determining the warranty period.

d. Normal exceptions to the warranty, such as combat damage or negligence, are contained within the warranty.

e. The warranty starts with Serial Number 010. The total price of the warranty is $60 million spread over a five year period. The warranty price was based on a mature Mean Time Between Maintenance (MTBM) of 50 hours for the Navigation pod and 112 hours for the Targeting pod.

ADVANCED TACTICAL FIGHTER

QUESTION: The Air Force has resisted efforts to start any joint U.S. - NATO fighter development program. What is wrong with that approach?

Wouldn't there be advantages, in terms of commonality and interoperability?

ANSWER: When European and US aircraft requirements are similar, a cooperative development program can offer significant advantages in terms of both commonality and interoperability. The joint development of the F-16 with selected European allies was a good example of this approach.

In terms of next generation aircraft, however, it appears that US Advanced Tactical Fighter requirements differ substantially from the requirements of our European allies for their European Fighter Aircraft (EFA). EFA requirements specify a multi-role, 25,000 pound class fighter optimized for the European theater of operation. The EFA would utilize early 1980s' technology and an existing engine derivative. This approach will result in a EFA design with performance comparable to the F-16.

ATF requirements specify an advanced air superiority design which would use state-of-the-art technology to achieve performance, supportability, and survivability features which cannot be satisfied by the EFA approach in the late 90's. The ATF is being designed to operate in Europe but US global responsibilities dictate a larger, more capable air superiority aircraft in the 50,000 pound class aircraft capable of long range missions and unrefueled ferry to potential theaters around the world beyond 1995.

Over the past three years, the Air Force conducted a number of meetings with German Ministry of Defense planners and Luftwaffe senior officials to explore future fighter aircraft requirements and the possibility of cooperatively developing a common aircraft. Both sides concluded that differences in mission requirements resulted in aircraft designs differing significantly in size, precluding development of a common airframe. As a result, it was agreed to continue a dialogue as respective designs evolved and explore cooperative developments of subsystems or applicable technologies.

Five European nations led by Germany, France and the United Kingdom then formed a consortium to plan the EFA. Because of economic and political considerations as well as the recognized difference in requirements, the consortium did not invite the US to participate. All interested countries keep each other informed of their respective activities through existing forums such as Air Senior National Representative meetings and the NATO Air Force Armament Group.

JOINT ADVANCED FIGHTER ENGINE

QUESTION: The developmental engine for the ATF is called the Joint Advanced Fighter Engine, or JAFE. You are requesting $150 million for JAFE as part of the ATF development program.

What are the program goals for JAFE? Aren't you attempting to develop a fighter engine in the 32,000-35,000 pound thrust class?

ANSWER: The primary goal of the JAFE demonstrator program is to reduce risk in the development of new advanced engines for the ATF. The hardware demonstration will complete over 850 hours of test operation on each of two competitive engine designs to support the ATF Full Scale Development in FY 1989. This risk reduction phase includes both performance and durability testing and incorporates over 250 hours of accelerated mission testing.

The JAFE engines are 32,000 pound thrust class designs with engine cycles optimized for the supersonic flight regime.

F-100 and F-110 PRIORITY

QUESTION: We are also asked to fund $123 million for the Engine Model Derivative Program, which will develop higher thrust versions of both the F100 and F110 engines.

Why aren't you concentrating your engine R&D efforts on the successful development of higher thrust versions of the F100 and F110, instead moving out so rapidly on the JAFE?

ANSWER: The JAFE program for the Advanced Tactical Fighter (ATF) represents a significant technical advance in the state-of-the-art design of gas turbine engines. The program will develop a new centerline engine design as opposed to a derivative of an existing engine design. The JAFE program has already been initiated to have a fully developed/qualified engine that supports a 1995 ATF initial operational capability at an acceptable program risk.

The Air Force has determined that increased performance F100/F110 engines (IPEs) for our F-15/F-16 aircraft are necessary by the 1989 time frame in order to counter the improved threat. To achieve this mid-term solution, higher thrust versions of the F100 and F110 will be developed using funding from the Engine Model Derivative Program (EMDP) and the Alternate Fighter Engine (AFE) program. EMDP is being used to demonstrate the incorporation of proven technology into the existing F100/F110 engine designs to provide the required overall engine performance growth. The AFE program will qualify the F100/F110 IPE designs. The IPE program offers a logical transition to higher performance for our current aircraft during the period of time that the JAFE design is finishing development/qualification and entering production.

JAFE PRIORITY

QUESTION: Isn't JAFE a lower priority item for the engine R&D community than the EMDP at this point?

ANSWER: No. The JAFE development supports overall development of the Advanced Tactical Fighter (ATF). The EMDP supports development of Increased Performance Engines (IPEs) for use in F-15 and F-16 aircraft. The timing of the engine developments is consistent with the tasks to be accomplished with the totally new JAFE requiring longer to develop than the F100 and F110 derivative IPEs. Thus, each program supports a separate important engine requirement for the ATF and F-15/F-16 weapon systems.

ENGINE MODEL DERIVATIVE PROGRAM

QUESTION: Have all FY 1985 funds appropriated for the Engine Model Derivative Program been obligated?

ANSWER: Initial amount of FY 1985 funds released to the Air Force was $8.2 million. $73.5 million of FY 1985 funds were held by OSD pending HASC and SASC approval of a reprogramming request. Those approvals have been received and the $73.5 million of FY 1985 funds were released to the Air Force on 19 April 1985. Of the total $81.7 million in FY 1985 funds, $4.9 million has been obligated. The balance of the FY 1985 funds are planned for obligation as follows:

Engine	Amount	Date
J402	$2.0 million	August 1985
F100 Increased Performance Engine	$41.1 million	December 1985
F110 Increased Performance Engine	$33.7 million	December 1985

AIRCRAFT ENGINE COMPONENT IMPROVEMENT PROGRAM

QUESTION: We are also asked to fund the $139 million Aircraft Engine Component Improvement Program, which upgrades existing Air Force engines across the entire fleet. What is the difference in this program from the Navy's effort?

ANSWER: The Air Force Aircraft Engine Component Improvement Program (CIP) provides engineering support for all aircraft engines in the active Air Force inventory. To date there are 18 engine types in service with three new engine types being introduced. Approximately 30,000 engines valued in excess of $12 billion based on acquisition cost are in the current inventory. The major objectives of engine CIP are to improve flight safety, retain operational capability while improving operational readiness and to reduce life cycle cost of these engines. These objectives are most generally achieved by improving the durability and reliability of the engine components that operational usage has shown to be the limiting factors. There is no conceptual difference between the Air Force or Navy CIP programs. The only differences result from either Air Force unique or Navy unique engines (i.e. AF F100, USN F404), or the same engine in different aircraft (i.e. TF30 for AF F-111 and USN F-14 or TF34 for AF A-10 and USN S-3A). Of the 18 engine types currently operational in the Air Force inventory, 12 are also used in Navy aircraft systems. To preclude redundant tasks, or the services paying twice for the same CIP task, a Tri-Service CIP coordinating committee was established that includes membership from the Air Force, Navy and the Army. Meetings are held at least once a year. Where an individual service has a unique aircraft engine application, the CIP for that engine is fully funded by that service (i.e. AF F100 or USN F404). In cases where two or more services use the same engine in either the same or different aircraft, a joint program is established under a single contract for that engine with both services providing their fair share of CIP funds (based on their engine inventory). Historically, the service with the largest inventory of in-service engines is designated as the Executive Service and will be responsible for the contract.

ENGINES THRUST IMPROVEMENT PROGRAM

QUESTION: We understand that the Secretary of the Air Force has recently decided to upgrade the F100 and F110 engines to 29,000 pounds of thrust. These higher thrust engines will be delivered to the Air Force by 1989.

Dr. Cooper, could you tell us how the engine thrust improvement program will be structured? Will there be competition and warranties similar to the Alternate Fighter Engine competition?

ANSWER: The Alternate Fighter Engine (AFE) competition will be used as a model in drafting the development program for F100 and F110 Increased Performance Engines (IPEs). This development program will lead to competitive procurement of the IPEs to satisfy engine requirements for F-15 and F-16 aircraft delivered in CY 1989. Warranties and/or guarantees comparable to the AFE warranties will be required for the IPEs.

ENGINE DURABILITY

QUESTION: Will the program include specific requirements for engine durability, so that as we develop higher thrust engines we'll be ensured that there won't be reliability and maintainability problems?

ANSWER: Yes. The development program for F100 and F110 Increased Performance Engines (IPEs) will require these new engines to have warranties, "ilities" (durability, reliability, maintainability, operability) and support costs comparable to the levels established by the Alternate Fighter Engine competition F100-PW-220 and F110-GE-100 engines.

F-16F PROGRAM

QUESTION: Last year, this Committee recommended withholding obligation of $24 million to start the F-16F development program until such time as the Air Force initiated the engine thrust improvement program. Our analysis continues to show that the F-16F - weighing nearly 48,000 pounds -- will require a much higher thrust engine if air-to-air capability is not to be lost.

Do Air Force theater commanders agree that the F-16F requires a higher thrust engine than the F-110?

ANSWER: The Air Force considers it likely that the F-16F, and other models of both F-16s and F-15s as well, will require Improved Performance Engines (IPE) by the early 1990s in order to more adequately address the projected threat.

F-16F THRUST ENGINES

QUESTION: Will the F-16F be baselined with one of the 29,000 pound thrust engines you intend to develop?

ANSWER: The F-16F will be produced concurrently with F-16Cs. In order to realize maximum production efficiencies, both aircraft will be equipped with the same engine which may be an Improved Performance Engine (IPE). The Air Force has developed a program, currently under review within OSD, to ensure availability of these engines for both F-16s and F-15s in the timeframe in which the F-16F will be introduced.

F-16F PROGRAM RECONSIDERATION

QUESTION: The F-16F development program will cost $610.7 million between FY 1985 and FY 1990, according to budget information recently provided to the subcommittee.

Given the budget squeeze, are you reconsidering the F-16F program?

ANSWER: Air Force requirements and programs to satisfy those requirements, including the F-16F program, are continually under review and refinement in order to achieve maximum cost effectiveness. It is our intent to build the most capable force possible within the bounds of fiscal constraint. The F-16F development program remains under consideration within this context.

F-20 PROGRAM

QUESTION: The F-20 would have to use the Navy F-404 engine. This would introduce yet another engine into the Air Force inventory.

Would it be feasible to adapt the F-20 to use the F-100 or F-110?

ANSWER: The F-100 or F-110 engine will not fit into the F-20 aircraft. The F-20 uses an 18,000 lb variant of the Navy's F-404 engine which should not be a major problem since the Navy developed the engine from two sources. Over 800 404's are currently in the Navy inventory today and therefore, the engine base is established.

F-20 CERTIFICATION

QUESTION: Will the F-20 have to be certified to carry the full range of Air Force ordnance and missile payloads?

ANSWER: The F-20 will have to be certified prior to the operational carriage of any external stores. The specific list of ordnance and configurations will depend on the mission assigned to the aircraft. The assignment of a specific mission and ordnance load for the F-20 has not yet been defined.

C-17 AIRLIFTER

QUESTION: Mr. Secretary, this is a key budget year for the C-17 airlifter. The budget for the C-17 full scale development program increases from $123 million to $453 million, a total of $330 million.

Can you restate for us the priority of the C-17 in the Air Force's overall airlift planning for the 1990s?

ANSWER: C-17 is the key program in the Air Force's overall airlift planning for the 1990s. It is the top priority program to meet our long range airlift capability goal of 66 million ton miles per day by FY 98.

C-17 is the least life cycle cost alternative which can increase total airlift capability, replace capability lost from retiring C-141 and C-130 aircraft in the 1990s, and modernize the airlift force. Any other alternative will have higher operating costs and personnel requirements, and does not provide needed tactical outsize cargo capability.

It is the best alternative to meet airlift requirements at the lowest total cost.

ACQUISITION OF C-17

QUESTION: How does acquisition of the C-17 resolve our current shortfall in airlift?

ANSWER: Acquisition of the C-17 resolves the airlift shortfall by adding both intertheater and intratheater airlift capability through FY 98 at the lowest life cycle cost.

FY 87 funded intertheater airlift capability is projected to be 47.8 million ton miles per day (MTM/D). This still leaves a shortfall of 18.2 MTM/D in meeting our long term goal of 66 MTM/D. The acquisition of C-17 follows near term capability increases through FY 87 by procurement of C-5Bs and KC-10s, and by adding Civil Reserve Air Fleet cargo capability. Following these programs, we begin procurement of the C-17 aircraft in FY 88 to continue increasing capability to reach 66 MTM/D in FY 98. The phasing of these programs maintains funding within fiscal constraints and gradually increases overall airlift capability.

OPERATIONAL ADVANTAGES OF C-17

QUESTION: What are the operational advantages of the C-17 compared to the C-5B and the C-130?

ANSWER: The C-17 blends the intertheater and outsize cargo capability of the C-5 with the intratheater, airdrop and austere field performance of the C-130. The C-17 is an integrator of existing technology, offering commanders unprecedented deployment and employment flexibility that neither the C-5 nor the C-130 can provide.

Practically unlimited range (with air refueling) and interior dimensions for outsize cargo make the C-17 a formidable strategic airlifter capable of moving all of the Army's real firepower, including the M-1 tank, the M109A1 Howitzer, and the UH-1H Blackhawk helicopter. The C-17 goes beyond the traditional intertheater role, though, to deliver that firepower over intercontinental distances directly to the forward battle area. Direct delivery eliminates the transshipment problem to speed unit closure, bypasses congested major airfields where C-5s, C-141s and CRAF aircraft must operate, and eases the already heavy burden on our C-130 fleet and surface lines of communication.

In the tactical mode, the C-17 redefines the intratheater mission. The ability to deliver outsize equipment routinely into austere forward fields is a first. Combat offload as well as outsize airdrop and extraction capabilities offer additional flexibility. These characteristics coupled with unique survivability features will permit the C-17 to augment our C-130s, covering the longer range missions (e.g., SWA, NATO flanks, Pacific) and the outsize cargo requirements which the C-130 cannot.

The technology integrated into the C-17 offers an airplane that transcends the traditional two-phased approach to the airlift problem. Clearly, the C-5 and C-130 will still be valued assets within their traditional roles. The C-17, however, will complement both, affording commanders a degree of airlift flexibility never before available.

C-17 TERMINATION IN OUTYEAR OPTION

QUESTION: Should the C-17 be terminated, how would you restructure your airlift master plan? Would you seriously consider extending the C-5B program? Isn't an outyear option without the C-17 more expensive than one with it?

ANSWER: Termination of the C-17 program would cause a significant change in our current airlift plan. This would necessitate reconsidering a number of alternatives, including additional C-5Bs, to reach our long term goal of 66 million ton miles per day.

The airlift master plan specifically examined adding C-5Bs or C-17s following the near term procurement of 50 C-5Bs, 44 KC-10s, and adding Civil Reserve Air Fleet cargo capability. Accounting for the needed retirement of 180 C-130 and 54 C-141 aircraft in the 1990s, the master plan examined procurement of 180 primary C-17 aircraft or 156 C-5B and 180 C-130 aircraft to replace the retiring C-130s. The C-17 option did not require additional C-130s because of its tactical capability. Results of the analysis showed the C-17 option was $16 billion (FY 82 dollars) cheaper over 30 years and required nearly 15,000 fewer personnel than the C-5B/ C-130 option.

Because of the C-17's lower operating/support cost and manpower requirements, any outyear option that does not include the C-17 will result in higher overall costs.

IFF (IDENTIFICATION FRIEND OR FOE)

QUESTION: Dr. Cooper, we understand that the US and the West Germans finally have come to an agreement on an IFF (Identification, Friend or Foe) System that will be used by both countries and the British.

What does this mean in terms of modernization of NATO's IFF system and overall NATO Interoperability?

ANSWER: This agreement is a giant step towards achieving both modernization and interoperabiity of NATO IFF systems. As you know, not all of NATO has the capability to perform the IFF function in the military secure mode. In addition, the current IFF system has several performance limitations. The NATO Identification System (NIS) Direct Question and Answer Subsystem is being designed to resolve these problems. The agreement on the operating frequency band was reached between the major producing nations, the US, the UK, France and Germany. The expected result will be a NATO Standardization Agreement (STANAG) that will allow any NATO nation to manufacture NIS IFF equipment to interoperate with any other NATO nation's equipment.

Our work is not completely done. There will be many discussions during the coming development as the specifics of the waveform are examined to accommodate particular national concerns. The US has said we will not unilaterally change the current D-band waveform but there is certainly room for accomodation as the design evolves. The major hurdle has been overcome, however, as there is now a common basis from which to start.

The end result will be a modern system interoperable within NATO. This system will be designed to meet the projected threat and to provide the Alliance with the capability to identify NATO aircraft at ranges compatible with weapons platforms prime sensors.

FSD

QUESTION: The Mark XV IFF program was delayed two years due to the NATO negotiations.

When do you plan to begin FSD? Can the program be accelerated now that agreement has been obtained on the frequency it will work in?

ANSWER: Full Scale Development is scheduled to begin after the Milestone II Defense Systems Acquisition Review Council (DSARC) scheduled for March 1988. This date cannot be realistically accelerated since Congressional cuts of the AF and Navy FY 1985 President's Budget resulted in a restructuring of the current Demonstration/Validation phase to fit the resulting funding profiles.

The start of production can be accelerated depending on the amount of RDT&E and procurement funds available to the program. Now that there is agreement on the operating frequency band, the services will review the program during the next budget cycle and decide on the appropriate funding level. It appears that either a 1991 or 1992 production start is the most feasible, depending on the amount of tri-service funding available.

ENHANCED JTIDS

QUESTION: Another important Air Force communications program is Enhanced JTIDS (EJS). EJS is a high anti-jam voice system, whereas JTIDS is primarily a high capacity data system.

How will EJS-equipped F-16s communicate with Navy aircraft and carriers? Is there compatibility between EJS and Navy JTIDS?

ANSWER: Compatibility between EJS and Navy JTIDS will be accomplished via voice link through a Time Division Multiple Access (TDMA) mode on JTIDS frequencies in L-Band. Since OSD has directed the Navy to have a backward compatible TDMA mode in its JTIDS terminals, EJS will be able to communicate with any Navy JTIDS equipped platform.

EJS-EQUIPPED F-16s COMMUNICATIONS CAPABILITY

QUESTION: Will EJS-equipped F-16s also be capable of communicating with the F-15, AWACS and Army JTIDS facilities?

ANSWER: EJS will have a TDMA L-Band communications mode. This is the same mode used by Air Force and Army JTIDS equipment. Therefore, F-16s equipped with EJS will be capable of communicating with any of the mentioned platforms.

FITTING EJS INTO THE F-16

QUESTION: Can you fit the new EJS into the F-16 easily, or will there be some changes made to certain subsystems? How expensive are these changes?

ANSWER: Prior to OSD redirection of the EJS design in FY 84 to provide a TDMA L-Band capability, there was adequate space in the F-16 to accommodate EJS. Incorporation of the OSD-directed changes increased the size of EJS. However, to preclude impact on the F-16 avionics, the EJS design added a TACAN capability allowing the new EJS design to be fitted in the space previously allocated to EJS and the existing TACAN. This approach did not increase any F-16 costs.

F-16 Questions

QUESTION: The FY 1986 Budget Request shows three modification programs: Combustor Swirler, Improved Durability Combustor and Mainshaft Bearing with $12 million in FY 1985 funds that were not included in the FY 1985 Budget Request. Explain why these programs were not included in the FY 1985 Budget Request and from where the funds were made available in FY 1985.

ANSWER: The F-16 modification program is primarily composed of production update modifications which provide for the retrofit on delivered equipment of changes made in the production line. The three items listed were incorporated into the F-100 engine production line in 1985 to correct deficiencies identified in operational use. Retrofit into the existing inventory was considered prudent in FY 1985 to standardize configurations, keep support costs down, and insure high operational effectiveness. These programs were not included in the FY 1985 request because final engineering solution to the deficiencies had not been completed before the budget submission. Funds were made available for a timely implementation of these modifications when the Improved Inlet Anti-Ice Capability program was cancelled (FY 1985 appropriated amount was $15.2M)

Justification for F-16 Modifications

QUESTION: Also provide justification for the FY 1986 request for these programs.

ANSWER: Description of these programs are:

a. Combustor Swirler - 600 kits; $4.0 million

Description/Justification: The combustor will be modified to incorporate a newly designed swirler to improve the fuel to air ratio at the front end of the combustor. This change will reduce exhaust gas smoke.

b. Improved Durability Combustor - 696 kits; $5.4 million.

Description/Justification: Sections of the combustor have experienced axial and circumferential cracking which can lead to a portion of the liner breaking off and entering the turbine section. This can cause failure of turbine blades which increases engine maintenance and can also cause potential flight safety problems.

c. Mainshaft Bearing - 600 kits; $3.7 million

Description/Justification: The mainshaft bearing (number 5 bearing) develops microspalling on the outer race which can lead to low rotor seizure and severe low turbine damage. An improved bearing which is not subject to microspalling will be installed.

F-15 Modifications

QUESTION: Please explain why the FY 1985 request for the Multi-Stage Retrofit Program: A/B Series for $16.9 million for 12 kits in the FY 1985 Budget Request more than triples at $12.5 million for 4 kits in the FY 1986 Budget Request. Also explain why the FY 1986 request more than doubles from $45.0 million for 56 kits to $29.9 million for 17 kits in the FY 1986 Budget Request vice the FY 1985 Budget Request.

ANSWER: The change in cost of the Multi-Stage Retrofit Program for the A/B series is related to several things. First, it has been determined that five engineering validation/verification aircraft will be required to provide the data needed for installation on the various configurations of the A/B series. This accounts for a $10.4 million increased cost in the total program. Also, the Improved Combat Identification capability and an improved environmental control system had been planned as separate modifications and these have now been included in the configuration of the Multi-Stage Retrofit Program since they will be available to be installed in the same timeframe and will result in a more economical overall program. Lastly, the FY 85 budget request was based on estimates from the early contractor budgetary figures and we now have the engineering change proposal budgetary costs that include more definitive estimates than were available for the FY 85 budget. The Air Force intends to breakout the procurement of components to the manufacturers of the specific hardware as soon as the verification/validation aircraft nonrecurring efforts are complete which, we believe, will result in reduced unit costs in the outyears. The FY 85 and FY 86 funding changes are related to these overall program changes and the specific line items programmed for those years.

Depot Maintenance Contractor Support

QUESTION: Aircraft maintenance in FY 1986 will total $2.6 billion. Of this nearly $1.2 billion will be contracted out. The contracted maintenance has increased by 61 percent in the past two years while in-house maintenance has remained constant. Is contracted depot maintenance cheaper than doing the work in-house?

ANSWER: Since aircraft maintenance and modernization (modification installations) are integral to each other, they should be combined when comparing increases. This would bring the FY 86 total to $2,961 million and represent a 44 percent increase over FY 84 funding. The in-house maintenance cost has remained constant because we have driven the cost down between FY 84 and 86 by 22.6 percent when compared to contract inflation. This reduced costing is a result of increasing productivity in our depots, assuming better prices for repair parts, etc. If the in-house inflation rates were similar to the contract rates, the in-house costs would have increased between FY 84 and FY 86 by 17 percent and the difference between the contract and in-house increases would be 27 percent. This would equate to an average increase of 13.5 percent per year for contract workload and we do not consider this excessive.

Contract depot maintenance is not always cheaper than doing the work in-house. Cost is a key determinant of our organic/contract decision process, but it is not the only one. Factors such as organic capacity, workload urgency, unique theater support requirements and our ability to maintain organic war-time surge capacity must also be considered.

Component Repair

QUESTION: The FY 1985 budget included an increase of $334 million to fund an FY 1984 shortfall in component repair in addition to the FY 1985 requirement. Why doesn't the FY 1986 budget show a decrease to account for the one-time increase in the prior year?

ANSWER: Our requirements computation system updates itself each quarter and recomputes a new baseline for the current and next budget year. After submitting the FY 85 President's Budget we found and corrected a logic error in our computation of Variable Safety Levels. Correction of this error adjusted our baseline and reduced our FY 84 and FY 85 exchangeable requirements.

The $334 million became part of our FY 85 base line when comparing FY 85 to FY 86 to determine growth. The requirements determination system, which covers over 160,000 stock listed items, recomputes our needs globally and does not distinguish between requirements carried forward from previous years and new requirements. Hence, the FY 1986 President's Budget does not show a decrease to account for the one-time increase in FY 1985.

F-106 AIRCRAFT

QUESTION: I understand the Air Force will phase out the F-106 aircraft in FY 1986. It appears from the budget justification material that average flying hours will increase for the

F-106. What is the average cost associated with increasing F-106 flying hours and what benefits will derive from the action?

ANSWER: The F-106 phase out is currently underway with the Active Air Force programmed to be complete in FY 1986 and the National Guard completing its phaseout in FY 1988.

The average hours per Average Primary Aircraft Inventory (APAI) in FY 1986 is approximately the same as it was in FY 1983 and 1984, however, FY 1985 hours per APAI are depressed due to the phase out scheduling of aircraft during the last three quarters of the year. The budget justification material does not track aircraft phase outs on an aircraft by aircraft basis. When examined on a monthly basis, the actual possessed aircraft are flying at the same relative rate (304) as they did in FY 1984. Since the average hours per aircraft remain constant, there is no significant increase in cost. The average hours per aircraft in FY 1986 reflect the requirements of one remaining squadron and are the same as it was in FY 1983, 1984, and 1985 for that squadron.

B-52 MODIFICATIONS

QUESTION: What is the status of the B-52G/H External Air Launched Cruise Missile (ALCM) Carrier program?

ANSWER: The Air Force is on contract for all 195 kits (99 B-52G, 96 B-52H). The last lot was procured in December 1984. The final ALCM-modified B-52G was delivered in November 1984. The first B-52H to be modified for cruise missile carriage was completed in January 1985. This aircraft is currently being modified at Boeing to become the CSRL test aircraft. Deliveries of ALCM-modified B-52Hs is as follows:

FY 85	FY 86	FY 87	FY 88	FY 89	Total
4	23	24	23	22	96

B-1B MODIFICATIONS

QUESTION: What strategic launchers are being developed for the B-1B program?

ANSWER: The only strategic launcher being developed specifically for the B-1B is the 180 inch multipurpose rotary launcher. This launcher may be loaded with gravity nuclear weapons or short range attack missiles (SRAM). It is capable of being carried in each of the B-1B's three weapons bays. Additionally, the B-1B will be able to employ the common strategic rotary launcher (CSRL), which is being developed and procured for initial use on the B-52. The CSRL will enable the B-1B to carry the air launched cruise missile (ALCM) internally.

CSRL

QUESTION: Is the Common Strategic Rotary Launcher (CSRL) part of the Advanced Cruise Missile (ACM) Integration effort?

ANSWER: CSRL is not part of the Advanced Cruise Missile effort. Both programs are separate and distinct modifications. The CSRL program provides internal carriage of ALCM and gravity weapons for the B-52H. It also provides internal ALCM, ACM and gravity weapons carriage for the B-1B. The Advanced Cruise Missile Integration program provides external carriage of the ACM on the B-52H and the B-1B.

F-4 Modifications

QUESTION: Provide the status of the AIM-9L Capability and Low Smoke Engines Modifications program.

ANSWER: A competitive acquisition is now underway for the AIM-9L Capability Modification Program. Contract award is expected in September/October 1985. The program includes modification of launcher rails and an "off-boresight" capability for the F-4 D/E aircraft.

The contract for the original Low Smoke $5.0 million requested in FY 85 has been awarded and completes kit acquisition for the RF-4C aircraft. The additional $18.0 million appropriated by the Congress to complete the F-4 D/E aircraft is now in negotiation with contract award expected by July/August 1985.

ALR-74 RADAR WARNING RECEIVER UPDATE PROGRAM

QUESTION: Explain the increase from FY 1985 to FY 1986 in the ALR-74 Radar Warning Receiver Update program.

ANSWER: The increase from FY 1985 to FY 1986 in the ALR-74 Radar Warning Receiver (RWR) Update program is due to the larger number of ALR-74s being bought for F-16 C/D production aircraft (180 aircraft instead of 150 aircraft), and for replacement of ALR-46 RWRs on the F-4E and RF-4C aircraft.

F-16 OPERATIONAL CAPABILITY UPGRADE

QUESTION: What impact will the delay of AMRAAM production have on the F-16 Operational Capability Upgrade program in FY 1986?

ANSWER: The Operational Capability Upgrade (OCU) program will proceed on schedule. Wiring for AMRAAM is part of the OCU which also includes expanded memory capabilities in the Fire Control Computer and the Stores Management System, radar enhancements, Data Transfer Unit for increased response times, and Combined Altitude Radar Altimeter for increased safety and survivability. The modification is structured so that when AMRAAM missiles become available, the aircraft will only require a field software modification to make them fully capable.

CIVIL RESERVE AIR FLEET

QUESTION: How are actual prices for the Civil Reserve Air Fleet (CRAF) modifications as compared to the budget for FY 1984 and FY 1985? Are any savings anticipated in the FY 1986 program?

ANSWER: The FY 1984, FY 1985, and FY 1986 budgets reflect the actual contract options' costs. No significant savings are expected in FY 1986.

Depot Maintenance Requirements

QUESTION: The budget justification material notes flying hour increases are partially responsible for higher depot maintenance requirements. What is the total cost of depot maintenance increases due to higher flying hours?

ANSWER: The total cost of depot maintenance increases due to higher flying hours is approximately $71 million.

Discrepancy in KC-135R Interim Contractor Support

QUESTION: The FY 1985 budget showed ICS for 35 KC-135R while the FY 1986 justification discussed 30 KC-135 supported in FY 1985. Please explain this discrepancy. Why is there no difference in the program costs?

ANSWER: The reduction from 35 to 30 KC-135Rs to be supported in FY 85 results from the Air Force decision to buy components directly from the vendors rather than through Boeing. This action increased the administrative lead times necessary for procurement of the components and changed the modified aircraft delivery schedule. The cost of ICS shown in the FY 85 PB was an early estimate of the funds required to support the program. Recent revisions to that estimate required an increase in the cost per aircraft for ICS.

KC-135R REENGINING UNIT COST

QUESTION: What is the unit cost associated with KC-135R reengining installations in FY 1984 through 1986?

ANSWER: Actual unit costs (for installation only of KC-135R kits), based on negotiated contracts, were $1.587 million in FY 1984 and $.8012 million in FY 1985. The estimated unit cost in FY 1986 is $.6182 million.

KC-135R PROGRAM SCHEDULE

QUESTION: Please provide a schedule of KC-135R kit deliveries, installations and support cost from program inception through FY 1986.

ANSWER:

	82	83	84	85	86
Kit deliveries	1*	-	6	29	33
Installations	1*	-	5	28	32

*For prototype aircraft used for test program. Prototype was converted to production configuration following test and delivered as a production article in June 1984.

The Air Force Directorate of Cost and Management Analysis computes the annual operating and support costs of an active duty KC-135R flying 400 hours annually at $2.72 million in FY 1985 dollars. With 13 KC-135Rs in the operational inventory as of 1 May 1984, we do not have enough data to be more precise.

KC-135R Interim Contractor Support

QUESTION: Why is interim contractor support required for the KC-135R in addition to cost of the mod installation? What support is the contractor providing? How long will interim support be required?

ANSWER: Interim Contractor Support (ICS) is required for the KC-135R to provide depot level maintenance support until FY 1988 because of the lack of support equipment and technical data. The concurrency in this program has delayed the design and production of support equipment and related technical data affecting the following newly designed systems:

Flight Control Augmentation System
CFM-56 engine
Auxiliary Power Unit
Electrical power
Hydraulic power
Turbine Engine Monitoring System
Fuel Temperature System

Similar support problems affect modified systems, including landing gear, air conditioning/pressurization, fire detection/suppression, instruments, autopilot systems and the basic airframe. The ICS contractor will provide all necessary test and repair for components from these systems including operation of the engine test cell. Development of complete organic depot capability in FY 1988 is dependent on timely delivery of support equipment and development of technical data.

AIR FORCE BASE OPERATIONS

QUESTION: The requirement for base operations in FY 1984 as shown in the FY 1985 budget is $322 million lower than reported spending shows in the FY 1986 budget. What significant changes occured to allow the additional funding to become available? What is the effect on requirements in FY 1985 and 1986?

ANSWER: The difference between the alignment of FY 1984 estimates in the FY 1985 PB and FY 1984 actual in the FY 1986 PB is less than 2 percent of the Operation and Maintenance Air Force Appropriation. These adjustments are part of a fact-of-life process that occurs during the execution year of the O&M program. Examples of some of these changes are program accelerations and slippages, adjustments in classified programs, contract prices higher or lower than estimated, national contingencies, and many other adjustments that cannot be predicted. Resources that may become available as a result of these adjustments are applied against other high priority requirements such as reductions to the backlog of facility maintenance and repair projects (BMAR). In FY 1984, the real property maintenance activity received approximately 82% of the 314 million that was transferred into the Base Operations activity group.

Some of the significant changes are as follows: ($Millions)

- TR-1 $15

FY84 flying hours were erroneously programmed for a combination of wartime and peacetime rates. FY85 and FY86 are properly programmed at a peacetime rate.

- AWACS $12

First year sustaining engineering estimates were overstated. FY85 and FY86 estimates are based on actual experience

- Classified Programs $30

Slippages in Classified Programs

- JA/ATT Program $21

Joint Airborne Air Transportability Training flying hours were underflown due to C-130 and C-141 Air Frame non-availability. Thirty-six C-130 aircraft were in time compliance tech order maintenance. Higher priority SAAM and exercise missions for contingencies (urgent fury) resulted in C-141 underfly. Military Airlift Command has issued guidance for FY85 specifying that the JA/ATT mission will be given sufficient priority to ensure all Services readiness training is accomplished.

- C-5 Allowable Cabin Load $11

Channel hours flown by unmodified C-5 aircraft were less than estimated and resulted in less direct O&M AF funding. The final C-5's enter the depot for wing modification in FY86 and the O&M direct funding phases out.

- Ballistic Missile Early Warning System (BMEWS) Modernization $6

Work requests in support of the BMEWS modernization effort at Thule AB, Greenland were less than estimated. The modernization program was adjusted to reflect this actual experience.

- NORAD Command and Control System Upgrades $14

Actual costs for providing the program baseline for the NORAD Command and control System were less than originally budgeted due to rephasing of an acquisition program and transferring the acquisition responsibility to the Air Force Systems Command in the R&D Appropriation. The FY85 and FY86 requirements have been adjusted based on the rephased program.

- First and Second Destination Transportation $50M

Procurement deliveries to the Air Force Logistics Command under the 3010 appropriation were projected to be $6.6 billion in FY 1983 and $9.4 billion in FY 1984. However, actual deliveries were $6.1 billion and $8.2 billion, respectively. Deliveries under the 3080, BP 8100 appropriation, were projected to be $547 million in FY 1983 and $904 million in FY 1984. Actual deliveries were $525 million and $686 million. These lower levels of procurement deliveries, coupled with minor changes of a similar nature in other major commands, reduced the expenditure of First Destination funds by $9.5 million. Due to political problems with host nation agreements, the movement of vehicles and housekeeping equipment to Europe and the CENTAF area of operation did not occur as programmed. For the same reason, ammunition programmed for these areas was not moved. This reduced Second Destination Transportation (SDT) requirements by $16 million. Mail shipments were also lower than anticipated by $18.5 million. Finally, $8.0 million was added to the Air Force's budget to establish a contract airlift (CONAIR) system in Alaska. Since the budget was not approved until the second quarter of FY 1984 and the contract for this system had to be sized, offered to carriers, and bid upon the system was only in operation the final quarter of FY 1984 and expended $5.6 million less than provided by Congress. Differences in FY 1984 actuals have been recognized and programmed accordingly in FY 85 and 86.

- Depot Maintenance $23

The historical underfunding of BOS and RPMA activities (utilities, base services, facility projects) required the reprogramming of lower priority DPEM workload so that essential services could be funded. The deferral of FY84 DPEM workload has caused backlog growth of $13 million and $60 million in FY 85 and FY 86 respectively.

- Minimally Attended Radar in Alaska 6

The introduction of minimally attended radars in Alaska began in FY84. Actual costs to operate and maintain these new long range radars were less than originally estimated. The FY85 and FY86 programs were adjusted to reflect this actual experience.

- Air Launched Cruise Missile (ALCM) $9

Follow-on operational, test, and evaluation (FOT&E) support was scheduled for all of FY84 but was provided for only the last three months due to non-transition of requirements from the R&D Appropriation. Additionally, supplies and equipment required to support the ALCM deployment were less than estimated. FOT&E is on schedule for FY85 and FY86 and the supply and equipment accounts have been adjusted based on actual experience gained in FY84.

- Data Processing Cost $13

Contract price changes for rental of data processing support of TAC Air Intell System, TAC command and control, and electronic combat support. Purchase of previously leased base support ADP.

- Chemical Biological Program $5

Non availability of CB clothing from the Defense Personnel Support Center (DPSC)

- Rapier $7

Program slipped to FY85 and transferred to the missile procurement appropriation (3020)

- WRM Equipment $5

Country - to - country agreement delays caused slippage in prepositioning.

- Civilian Pay $12

A zero balance realignment to properly record civilian pay between base operation support and other budget activity groups.

- FMS Reimbursement $4

Earned reimbursements exceeded original estimates. FY85 and FY86 have been adjusted to reflect this experience.

F-4 IMPROVEMENT PROGRAM

QUESTION: The Air National Guard has endorsed an alternative to upgrade 336 of the younger F-4s with a longer-range radar, AMRAAM missiles, and conformal fuel tanks. General Russ, what is your assessment of this proposal.

ANSWER: Our requirements for the F-4 fleet will depend upon our future force structure and how we plan to use that force structure. We are still assessing the capability of the Air National Guard's proposal to meet those requirements based on technical feasibility, cost, and the threat we expect the F-4 fleet to face.

QUESTION: You're requesting over $500 million for three major engine R&D programs - the Joint Advanced Fighter Engine, the Engine Model Derivative Program, and the Aircraft Engine Component Improvement Program. Isn't there a fair amount of redundancy in these programs?

ANSWER: The Joint Advanced Fighter Engine (JAFE), the Engine Model Derivative Program (EMDP), and the Aircraft Engine Component Improvement Program (CIP) are three distinct engine programs each with different Air Force goals. The JAFE will be an advanced propulsion system designed for specific application in the Advanced Tactical Fighter (ATF) and will be available to support an ATF initial operational capability in FY 1995. It will incorporate technologies that have been in development for the past 10-15 years. The planned operating environment of the ATF is different from the F-15/F-16 role, dictating a JAFE design that will be different from existing or higher performance versions of the F100/F110 engines.

EMDP is being used to demonstrate the incorporation of proven technology into the existing F-15/F-16 engines (F100/F110) to provide mid-term engine performance growth to counter the increased threat in the 1989 timeframe.

The Component Improvement Program provides engineering support for the 18 current model engines in the active Air Force inventory. The major objectives of the engine CIP are to improve flight safety, retain operational capability, improve operational readiness and reduce engine life cycle cost.

QUESTION: How can the engine manufacturers efficiently absorb all this in one fiscal year?

ANSWER: Since the goals and program phasing of each of the engine programs described are different, the contractor must make use of engineering expertise, test facilities, fabrication/assembly areas at different times and intensity levels during the fiscal year. Part of the management challenge for both the contractor and the Air Force Program Office is to ensure that the contractor makes the most efficient use of all his available assets, allowing each engine program to proceed without interference from the other. In reviewing the diversity of the tasks to be accomplished and the involved contractor's capabilities, we have concluded that the $411 million FY 1986 budget request for these programs can be used efficiently.

C-17 AIRLIFT PROGRAM HIGHER PRIORITIES

QUESTION: The C-17 budget increases from $123 million to $453 million at the same time the Air Force wants to double the production rate of C-5B from 8 to 16. What is your higher priority, accelerated production of C-5 or development of the C-17?

ANSWER: The increase in production from 8 to 16 C-5B aircraft reflects the next quantity option in the C-5B contract and is not being exercised in lieu of C-17 development. The C-17 is the number one priority airlift program in the Air Force. C-5B production and development leading to procurement of the C-17 are both needed to meet airlift requirements. We have built an airlift program which addresses additionally needed capability as well as airlift force structure modernization. The C-5B provides near term capability while C-17 is our long term program to meet overall airlift requirements. The programs are complementary and phased to efficiently increase capability within realistic funding guidelines.

C-17 COST PROJECTION COMPARISONS

QUESTION: The Air Force assumes the C-17 will be significantly cheaper to operate and support than the C-5 and C-130 airlifters. Since there is no operational experience on the C-17, why are you confident in these cost projections?

ANSWER: Our assumption that the C-17 will be significantly cheaper to operate and support than the C-5 and C-130 airlifters is based on incorporation of proven and modern technologies plus contractural requirements that warrant specific reliability and maintainability parameters.

Virtually all C-17 subsystems are in either commercial or military aircraft in service today. The engines will have over six million hours of service on the B-757 aircraft before the C-17 initial operational capability in 1992. Avionics, pumps, and flight controls are in use on the DC/KC-10. Designed-in access to components and extensive fault isolation will facilitate repair and reduce down time. The powered lift and thrust reverser systems were demonstrated on the YC-15 prototype aircraft in the mid-1970s. Modern technology will reduce aircrew and maintenance personnel requirements and in turn will result in lower operating costs.

The C-17 contract requires that the aircraft meet specific reliability and maintainability parameters. If any of the parameters are out of specification, the contractor must correct the problem to bring the system within limits and at no increase in contract price.

We believe that incorporation of current technology and by stressing reliability in the design phase we will acquire an airlift aircraft that is far cheaper to operate and support than any current system.

C-17 TERMINATION IN CURRENT PLAN

QUESTION: Should the C-17 be terminated, how would you restructure your airlift plan? Would you consider extending the C-5B program? If so, how does the cost of this alternative compare to your current plan?

ANSWER: Termination of the C-17 program would cause a significant change in our current airlift plan. This would necessitate reconsidering a number of alternatives, including additional C-5Bs, to reach our long term goal of 66 million ton miles per day.

The airlift master plan specifically examined adding C-5Bs or C-17s following the near term procurement of 50 C-5Bs, 44 KC-10s, and adding Civil Reserve Air Fleet cargo capability. Accounting for the needed retirement of 180 C-130 and 54 C-141 aircraft in the 1990s, the master plan examined procurement of 180 primary C-17 aircraft or 156 C-5B and 180 C-130 aircraft to replace the retiring C-130s. The C-17 option did not require additional C-130s because of its tactical capability. Results of the analysis showed the C-17 option was $16 billion (FY 82 dollars) cheaper over 30 years and required nearly 15,000 fewer personnel than the C-5B/ C-130 option.

It was the lower cost and manpower requirements plus the additional tactical capability that the C-17 provides which resulted in the current plan. Any change in that plan would result in higher operating and support costs plus more personnel to meet long range airlift requirements.

C-5B CONTRACT SAV[illegible]

QUESTION: The recent C-5B contract renegotiation yielded a savings of over $400 million, principally based on lower inflation costs. Since the contract was signed barely two years ago, what was the Air Force estimate for inflation and why was the projection a part of the original contract negotiation?

ANSWER: The $439 million saved on the C-5B program was not achieved through renegotiation of the C-5B contract. Rather, the savings resulted from a contract adjustment based on the existing Economic Price Adjustment (EPA) provision contained in the contract. Due to a lower than expected inflation rate, funds were deleted from the contract. In addition, the Government and the contractor agreed to change the EPA clause to reflect a reduction in the average annual estimated inflation rate from 7.6% to 5.6%. The EPA clause provides for the Government to pay the real cost of inflation, thereby greatly reducing the potential for windfall profits on those items covered by the EPA.

In December 1982, when the Air Force and Lockheed negotiated the original C-5B contract, inflation was forecast at an approximate annual rate of 7.6%. The inflation projection was a part of the original contract negotiation because it was an essential element of the type of contract used. The C-5B is being produced under a firm fixed price contract with an Abnormal Escalation Cost Index EPA provision. This provision required the initial contract price to be based on an estimate of future inflation. When there is a difference between the original estimate and actual inflation, as published in the Bureau of Labor Statistics Indices, the contract price is adjusted to reflect the actual inflation rate.

AIR FORCE CONTRACT PAYMENTS (C-5B)

QUESTION: Does the Air Force make contract payments against the negotiated inflation estimate or the economic actual?

ANSWER: The Air Force makes contract payments against the actual inflation rates as they are reflected in updated BLS indices. The C-5B is procured under a firm fixed price contract with an Economic Price Adjustment (EPA) provision. This provision requires the original negotiated price to be adjusted to account for the actual rate of inflation on an annual basis. In accordance with the contract this rate is obtained from the Bureau of Labor statistics.

C-5B RENEGOTIATED INFLATION ESTIMATE

QUESTION: What is the renegotiated inflation estimate in the C-5B contract?

ANSWER: The current average annual 5.6% inflation estimate in the C-5B contract was not arrived at through renegotiation. Rather, the Air Force and the contractor agreed to adjust the original projected inflation rate contained in the Economic Price Adjustment (EPA) provision from 7.6% to 5.6%.

C-130 AIRCRAFT BUDGET

QUESTION: Every year the Air Force fails to budget for C-130 aircraft and every year Congress adds funds for the program. Since the Air Force is always bemoaning the paucity of airlift, why don't you budget for C-130s?

ANSWER: The Congressionally Mandated Mobility Study (CMMS) identified a number of airlift issues including both inter- and intratheater shortfalls. The Airlift Master Plan (AMP), which guides the development of our airlift force structure, provides a balanced, fiscally responsible approach to solving the various airlift issues raised by the CMMS. Procurement of C-5Bs and KC-10s, CRAF enhancement, life-extension programs for the C-130s and C-141s, and C-17 development are all important elements of the AMP. These programs dovetail to meet as much of the near-term shortfall as possible while, at the same time, addressing long-term airlift requirements.

While we could certainly use more C-130s, such a purchase is unaffordable within the Air Force TOA constraints. Diverting funds from other airlift enhancement programs to purchase additional C-130s today would disrupt the balance achieved under the AMP and introduce a piecemeal approach to the overall airlift problem.

The future is a parallel concern. As useful as the C-130 is today, its technology is self-limiting. At some point, we must curtail our investment in assets of limited future value and allocate funds for modernization (e.g., the C-17) and research into follow-on aircraft designed to meet future requirements.

FIGHTER PROGRAM COMPETITION

QUESTION: The Northrop unsolicited proposal offers 396 F-20s at a firm fixed price of $15 million each based on a multiyear contract. The proposal doesn't meet traditional multiyear guidelines of design stability and significant savings over an annual buy since there have been no production F-20s comparison. While a multiyear contract is premature, how could the Air Force capitalize on this opportunity to introduce competition into the fighter program?

ANSWER: Multiyear procurement is an investment strategy that can provide savings; however, as in the case of the alternate fighter engine, greater savings may be achieved in a competitive environment.

Based on these considerations, we are now investigating an acquisition strategy that features competition. This may enable us to buy an increased quantity of aircraft that meet our minimum essential needs at the least possible cost.

F-16 vs F-20

QUESTION: The recent Navy competition for aggressor aircraft yielded a less complex and cheaper variant of the F-16 comparable to the performance characteristics of the F-20. Couldn't an Air Force competition yield savings without giving up performance features?

ANSWER: A competition between an F-16 and an aircraft with comparable mission capability could potentially yield a lower unit cost. Several factors would need to be considered in such a competition. For instance, the mission requirement for the competing aircraft would have to be clearly defined and articulated. Savings from the competition would need to offset initial startup costs, such as development, test, production nonrecurring, and support, associated with producing and introducing a new aircraft into the inventory. The competitive pressure would also have to offset the loss of efficiency associated with smaller production quantities from all contractors.

FLIGHT HOUR COST PROJECTION

QUESTION: Northrop's offer includes a guaranteed $475 per flight hour cost which is about half the cost of the F-16 flight hour. The catch is the F-20 has less than 2,000 flight hours of experience to evaluate the validity of the estimate--but, if the proposal is accepted, the guarantee is the contractor's risk. Have you developed any confidence in this cost projection?

ANSWER: Northrop has currently met or exceeded all predictions thus far in its flight test program of the F-20. However we have been unable to determine if $475 is realistic or not. Northrop has not released the data to the Air Force and consequently, we are unable to verify and determine what all is included in the $475.

F-20 QUALIFICATIONS

QUESTION: Since the F-20 was originally designed to a foreign market standard, would the Air Force have to qualify the F-20 avionics and weapon systems to U.S. military specifications?

ANSWER: Although the F-20 was developed for Foreign Military Sales (FMS) market, it was designed so that it would meet US military specifications. Aeronautical Systems Division (ASD) is the command responsible for reviewing and approving all F-20 aircraft systems which include avionics and weapons systems. To date, all F-20 equipment submitted has met US military specifications and been approved.

F-20 CHANGES

QUESTION: Wouldn't a change to F-20 specifications add to the unit cost and if so, wouldn't these changes relieve the contractor from the firm fixed price guarantee?

ANSWER: Any additional AF specifications which were not included in the Northrop F-20 firm fixed price guarantee would have to be negotiated with Northrop prior to any AF procurement of the F-20.

F-16 FALCON

QUESTION: The budget proposes $3.4 billion to start the second multiyear contract for F-16 aircraft at a minimum of 180 per year for four years. Assuming no additions in the appropriation for F-20, can the Air Force still negotiate a lower quantity multiyear for F-16 without termination liability.

ANSWER: Yes, the Air Force could negotiate a lower quantity multiyear for the F-16 but some liability would be incurred. If the contract were cancelled at the beginning of FY86, the total not-to-exceed liability would be $158.0 million, $62.2 million of the liability would be related to the FY87 aircraft, $50.1 million would be associated with the FY88 aircraft and $45.7 million would be related to the FY89 requirements. These values are all not-to-exceed dollar levels. We would expect the residual liability of the government to be lower than these values through the workings of the normal claim proposal, evaluation and negotation process. However, the exact value of the residual claim can not be accurately predicted. The value of the final claim will be effected by the following factors:

(a) Date of the decision,
(b) What Fiscal years we decide to decrease
  - the later the FY, the smaller the impact,
(c) How much of a decrease in quantity,
(d) Recurring expenditures made to the date of decision, and
(e) At what performance point are the vendors when a quantity change decision is made.

F-16 MULTIYEAR AUTHORITY

QUESTION: Using the $171.2 million of advance procurement from the fiscal year 1985 appropriation to cover potential termination costs, Air Force started negotiations in December with General Dynamics for the second stage multiyear. What termination costs would be incurred if Congress denied F-16 multiyear authority?

ANSWER: If Congress denied the current F-16 multiyear authority and the buys reverted to annual buys of 150 per year the average unit price would increase from $19.8 million to $20.8 million. If the contract were cancelled at the beginning of FY86, the total not-to-exceed liability would be $339.9 million, $185.6 million of the liability would be related to the FY87 aircraft, $82.9 million would be associated with the FY88 aircraft and $71.4 million would be related to the FY89 requirements. These values are all not-to-exceed dollar levels. We would expect the residual liability of the government to be lower than these values through the workings of the normal claim proposal, evaluation and negotation process. However, the exact value of the residual claim can not be accurately predicted. The value of the final claim will be effected by the following factors:

(a) Date of the decision,
(b) What fiscal years we decide to decrease
  - the later the FY, the smaller the impact,
(c) How much of a decrease in quantity,
(d) Recurring expenditures made to the date of decision, and,
(e) At what performance point are the vendors when a quantity change decision is made.

F-16 TARGET COST

QUESTION: Looking back on the first multiyear contract from 1982-85, the Air Force had hoped for a savings of $257 million. But isn't it true that the target cost of this contract has increased from $2.6 billion to $3.3 billion?

ANSWER: Yes, the following table lists the evolution of the first multiyear contract from the original contract, through the contract modifications, to its present target cost of $3407.9 million.

F-16 MULTIYEAR PROCUREMENT (FY82-FY85)
COST TRACK
(THEN YEAR $ IN MILLIONS)

ORIGINAL CONTRACT COST (480 AIRCRAFT)	$2328.8
QUANTITY INCREASE	
EGYPT, 40 AIRCRAFT, FY82*	179.2
USAF, 24 AIRCRAFT, FY84	120.9
USAF, 30 AIRCRAFT, FY85	142.3
AVIONICS INTERMEDIATE SHOP PRODUCTION	117.4
SUPPORT AND TRAINING EQUIPMENT	163.5
INTERIM RELEASE (SUPPORT EQUIPMENT)	38.2
PLANNED ENGINEERING CHANGES	154.9
OTHER ENGINEERING AND CONTRACTURAL CHANGE PROPOSALS (EACH LESS THAN $4 MILLION)	162.7
TOTAL COST	$3407.9

*Originally added to the multiyear; now part of foreign military sales contract.

However, each of the modifications, except for the avionics intermediate shop (AIS) production, were amendments to the original contract as a matter of administrative necessity. They are annual procurements, not multiyear, that could have been contracted for on separate contracts. In the case of AIS, this was a multiyear procurement (MYP) addition. As with the original contract, AIS procurement via this means saved an estimated $14.4 million over an annual procurement of the same AIS.

Considering the following table of consistent unit cost reductions from 1981 through 1984, one can appreciate the true aircraft cost trend brought about by this MYP and production efficiencies.

F-16 SAR UNIT COSTS
(CONSTANT FY 1981 $ IN MILLIONS)

COST	DEC 81	DEC 82	DEC 83	**DEC 84
RECURRING FLYAWAY	9.7	9.8	9.0	8.8
PROCUREMENT	13.3	13.1	12.2	11.9
PROGRAM	14.2	13.7	12.7	12.5
(TOTAL PLANNED BUY)	(1985)	(2165)	(2651)	(2795)

** FIGURES EXCLUDE THE F-16F

None of the changes made since the award of the multiyear contract have diminished the $256.8 million savings achieved through the use of multiyear technique.

VIOLATION OF MULTIYEAR CONTRACTING

QUESTION: In large measure, this cost increase is attributable to three major change order interactions--the so-called Multinational Staged Improvement Programs--which loaded up the basic F-16 airframe with a variety of weapon system, radar and engine modifications. Isn't this a violation of the first rule of multiyear contracting to only select a candidate with a stable design?

ANSWER: The multiyear contract for the F-16 is for the contractor-furnished airframe only. The only hardware items associated with the Multinational Staged Improvement Program (MSIP) that were negotiated in this contract were the core avionics (e.g. multifunction displays, improved fire control computer). The design for these items was stabilized when the contract was negotiated. The provisions for MSIP systems in development (e.g. ASPJ, AMRAAM, GPS) were excluded from the original multiyear contract because of their inherent instability of design. Part of the increase to the multiyear contract was generated by the addition of Group A provisions for some of these items after design had matured. MSIP Group B hardware will be largely procured as government-furnished equipment. The improved radar is currently procured as GFE under annual type contracts. Airframe changes to accommodate the new alternate fighter engine were added by change order and will be negotiated separately. Therefore, we have followed the rule of only multiyear contracting for those items with a stable design. However, this does not preclude adding items for procurement on an annual basis to the multiyear contract. Further, none of the changes made since the award of the multiyear contract have diminished the $256.8 million savings achieved through the use of the multiyear technique.

REPETITION OF F-16 DESIGN CHANGE HISTORY

QUESTION: If Congress elects to proceed with the second multiyear contract, what confidence should we have that the F-16 design change history won't be repeated in the next four years?

ANSWER: Previous design changes to the F-16, such as the improved radar, reconfigured cockpit, more capable computers and power/structural/cooling provisions were incorporated to prepare the F-16 for later incorporation of advanced subsystems in the most efficient manner as possible. Major changes to the F-16 during the second multiyear include the addition of these major subsystems, such as AMRAAM, LANTIRN and ASPJ. As a result of the alternate fighter engine decision in Feb 1985, we will also incorporate a redesigned engine inlet to tailor the engine airflow to either the F100-PW-220 or F110-GE-100 delivered with the airplane.

ALR-69 SAVINGS

QUESTION: We're told the Air Force has slipped its plans to install the ALR-74 warning receiver on the F-16 due to some test problems. Since the ALR-74 is twice the cost of the current ALR-69, what budgetary savings result in the current request as well as prior years?

ANSWER: Assuming a slip from June 1986 (Block 30) to February 1987 (Block 30B), there would be more FY85 aircraft which would receive ALR-69s instead of the ALR-74. However, the recurring cost savings of $23.8 million would be offset by an increase in estimated nonrecurring costs of $23.7 million for the ALR-74. These additional costs include $5 million in reliability incentives for the contractor, and $18.7 million for system sensitivity improvements, high reliability redesigned components, increased system performance responsibility and software improvements.

B-1 BOMBER PROGRAM END

QUESTION: The requested $5.5 billion for 48 B-1 Bomber aircraft concludes the multiyear program and completes the 100 bomber objective. Is this really the end of the program or are we going to see a push for the 101st bomber?

ANSWER: The Air Force has no plans for additional B-1Bs. The "Two Bomber" program continues on track and the Air Force remains fully committed to this approach.

B-1 EXCESS FUNDS

QUESTION: Since 1981, the $20 billion target for the 100 aircraft has remained unchanged. But there is growing evidence that appropriated funds appear to be excess.

In November, GAO reported that the B-1B engine contract is $352 million lower than the Air Force estimate;

the latest accounting reports indicate an unobligated balance of $842 million in 1983 and 1984 even though the major contracts have been awarded;

$313 million is budgeted for engineering changes, but the Defense Department claims the design has been frozen.

Mr. Secretary, is this an accurate accounting of excess funding?

ANSWER: No, this is not an accurate accounting. Although the multiyear contract with General Electric (GE) was favorably negotiated, three major multiyear procurement contracts have yet to be settled. The engine line in the FY 1986 President's Budget, which reflects the results of the GE negotiation, is $191 million lower than the amount budgeted for fiscal years 1984 to 1986 in last year's budget. These dollars are being used to cover increased funding requirements in the airframe line. This redistribution between cost categories is not unusual. As the program has matured, negotiated contracts and additional cost performance data have replaced unnegotiated proposals and early cost data as the basis for estimating.

Unobligated FY 1983 and FY 1984 procurement funding balances, as of 28 February 1985, totaled $767 million, including $108 million identified by the Congress as a source of Peacekeeper financing. Essentially all of the FY 1983 balance of $252 million will be obligated against valid program requirements by July of this year. Of the $515 million unobligated balance in FY 1984, all but $54 million have been reserved against specific contract commitments. The $54 million is prudently reserved for contingencies such as correction of deficiencies and for ECO.

The B-1B's FY 1985 and 1986 engineering change order allowance of $313 million is available to address as yet unknown engineering change requirements of the Lot IV and Lot V buy of 82 aircraft. The B-1B design has been exceptionally stable, and no major changes have been added since the baseline content of the program was established in 1981. However, a relatively small budget (about 6 percent of recurring flyaway cost) has been provided in the baseline to address small engineering changes necessary to fully realize the weapon system's capability. We expect most of these required changes to be identified in our concurrent test effort.

At this time, our best estimate fully supports the validity of the FY 1986 B-1B procurement funding request.

B-1 PROGRAM REPORT

QUESTION: Last year, the Committee requested a detailed accounting on the B-1 program after all major contracts were awarded. Any savings identified were expected to be reflected in an amendment to the fiscal year 1986 budget request. What's the status of the report and when can Congress expect an amendment?

ANSWER: The three remaining multiyear procurement contracts should be awarded by July 1985. The Air Force fully intends to comply with the Appropriations Conference Report's direction to provide a full accounting of B-1B costs after those major contracts are awarded.

KC-135 TANKER REENGINING

QUESTION: The Air Force has been pursing an $8 billion program to reengine about 300 of the active force tankers with new CFM-56 engines. The request includes $700 million for 43 aircraft in 1986. CBO has proposed an alternative to combine the CFM-56 program with a plan to refurbish used 707 engines for 36 aircraft per year. This approach would save $2.6 billion over the next five years. What's your assessment of the option?

ANSWER: The CBO option mentioned gives us 50 fewer KC-135A equivalents than the other two options contained in the same CBO report and 166 more KC-135Es with less than the extensive reliability and maintainability improvements made in the KC-135R Modernization Program. The KC-135R's greater capability and lower operating and support costs will help offset the "up front" acquisition cost difference.

USED 707 ENGINE VS CFM-56

QUESTION: The used 707 engine alternative is about 1/2 as fuel efficient as the new CFM-56, but the cost per aircraft modification is about 20 percent the cost--$4 million versus $20 million. With the growing budget pinch, why not opt for the lower cost program?

ANSWER: The KC-135s reengined with used 707 engines have averaged $4.3 million; KC-135s modernized under the CFM-56 program in FY86 cost $16.9 million, including spares and installation. Acquisition costs are only part of the equation. We get 30 percent more operational capability and considerably more improvement in reliability and maintainability with the CFM-56 program. During source selection, life cycle cost studies showed the CFM-56-equipped tankers to have a cost/benefit advantage over KC-135s reengined with TF-33s (military version of the JT3D). Since that time, negotiated costs of the KC-135R have been below the estimates used in those analyses. Therefore, the Air Force considers continuation of the CFM-56 the best alternative, rather than opting for the JT3D modification.

BUDGET TO ACCOMMODATE CFM-56

QUESTION: Are you satisfied that future budgets will be large enough to accommodate the CFM-56 program?

ANSWER: During the FY85 budget cycle the Air Force TOA was reduced, and the KC-135R survived--albeit at a reduced profile. Deep budget cuts would tend to stretch the program even more, but the program should continue.

CFM-56 PRICE FORECAST

QUESTION: We're told that the unit price of the CFM-56 engine is projected to increase 35 percent. Over the last four years, Congress has approved funding for over 100 aircraft kits. Why are you forecasting an increase in price in this stage in production?

ANSWER: The appearance of a 35 percent cost growth between FYs 86 and 87 does not reflect actual cost. This can best be explained with a careful review of how each year's budget estimate was calculated.

The FY86 price is based on a firm-fixed price (FFP) cited in the FY84 engine procurement contract derived from a May 1982 base price (plus inflation) for the CFM-56. It is noteworthy that rather than the 7.4 percent contractor-unique inflation escalator, the system program office (SPO) negotiated a 6 percent escalator for FYs 84-86. We also negotiated prices for FYs 84-86 that were 92.5 percent of what commercial customers paid before a 10 percent price increase took effect in July 1984.

The FY87 budget price is based on a not-to-exceed (NTE) quote from the contractor and includes three separate price adjustments not included in the FY86 budgeted price. First, in July 1984, the contractor raised the base price of the CFM-56 by ten percent for all buyers except those who, like the Air Force, were protected with a FFP contract for FYs 84-86. Second, because the FY 87 estimate is based on a NTE quote, it includes a 10 percent price increase to cover uncertainty (contractor risk). Finally, inflation escalators for FY 87 have not been negotiated, and the estimate includes the assumed 7.4 percent contractor-unique inflation escalator. The impact of this assumption is to create an apparent 11.5 percent inflation rate between FY 86 and FY 87. The 11.5 percent inflation assumption compounded the actual 10 percent price increase in 1984 and the 10 percent risk factor of the NTE quote into an apparent 35 percent cost growth for FY87.

Since submittal of the FY 86 budget, we have conducted extensive discussions with the SPO and the contractor and have derived more reasonable estimates. Once we have exercised the FY 85 option for engines, the SPO will negotiate a FFP option for FY 87. By the time the FY 87 President's Budget is submitted, estimates of engine prices in FY 87 should be substantially below those shown in the FY 86 Budget.

REENGINED KC-135 OBLIGATED FUNDS

QUESTION: Last August Congress approved funds in the supplemental appropriation for 32 KC-135s to be reengined with the used 707 engines. We're told the Air Force still hasn't obligated the funds. What's the hold up?

ANSWER: The program management office competed the contract for the last of the JT3D reengining funded in the FY84 Supplemental. The program office will not be ready to award the contract until the July-August time frame. We'll obligate the funds then.

AIR GUARD & RESERVE TANKER ENGINES

QUESTION: In the past four years Congress has added funds to reengine over 130 of the Air Guard and Reserve tankers with refurbished engines. The Guard recently testified that the tankers are performing better than expected. Why does the active Air Force refuse to include the program in its budget plans?

ANSWER: The greater operational capability of the KC-135R does more to alleviate the tanker shortfall. The more complete modernization of the KC-135R offers greater reliability and maintainability and creates a life cycle cost/benefit advantage. For an asset that is likely to continue to operate well into the twenty-first century, we prefer to modernize with the CFM-56-equipped KC-135R. The KC-135R will take longer to complete, but it's the best solution to meet our operational requirements.

F-100 ENGINE MAINTENANCE

QUESTION: I understand that maintenance requirements for the F-100 engines which power both the F-15 and F-16 aircraft will increase by $75 million in FY 1986. This follows an increase of $90 million last year. What is the total cost of maintenance on the F-100 engine in FY 1986 and when will these costs level out?

ANSWER: Depot maintenance cost for the F100 engine for FY86 is $292 million.

The point at which maintenance costs for the F100 engine will level off cannot be predicted. While major modifications are in work or programmed that will increase the reliability and maintainability of the current F100, and while the F100-PW-220 (AFE) engine will come on board with even greater reliability, there is no plan to phase out older F100 engines. Additive maintenance requirements accrue each year as these new F100 engines are brought into the inventory and as those F100s in the current inventory continue to age.

F-100 ENGINE MAINTENANCE

QUESTION: I am informed that the F-15 aircraft engines are operated at less than full capability to limit damage to the engines. Are you aware of any problems which cause F-15s to be flown at less than maximum capability?

ANSWER: The durability of the F100 engine high pressure turbine caused us to lower the trim setting of the engine in 1979 to reduce the maximum engine temperature and extend the life of the turbine. In 1982, we improved the trim procedure to decrease the amount of time which the engine ran on the ground trim stand (consuming engine life) and preclude excessive engine-to-engine variation in thrust. The new procedures resulted in a fleetwide average thrust level of more than 97%, and assured a minimum of 95% of specification thrust. This reversible technique (engines can be trimmed back to higher thrust levels) was acceptable to the user and support communities; they recognized the need to preserve engine life and reduce demands on the support system.

We have continued to improve the turbine and increase turbine life from 900 cycles originally, to 1800 cycles in 1982. In FY86 we will begin a 10-year retrofit program that pushes the turbine life to 4000 cycles. As each engine is retrofit, the trim setting will be returned to full setting, with no adverse impact on the life of the turbine.

KC-135 FLYING HOUR PROGRAM

QUESTION: A recent Inspector General report states that KC-135 flying hours exceed requirements in FY 1985 by 33,000 hours costing $132 million. Have KC-135 flying hours been decreased to account for this excessive flying?

ANSWER: The audit computed a 33,000 hour excess by subtracting their estimate of the FY 1985 requirement from the FY 1983 President's Budget programmed KC-135 flying hours for FY 1985. While we agree that the audit pointed out several computational practices that could be improved, the Air Force does not agree that the FY 1985 KC-135 flying hour program exceeds requirements. We have gone through two years of intensive review since the audit was conducted, used suggestions made by the audit to improve our estimates, and have refined the stated KC-135 flying hour requirement from 204,376 hours to 168,971 hours. Even so, Air Force estimates are much greater than those suggested by the audit. If KC-135 flying hours were reduced to audit levels, the air refueling proficiency of aircrews across the Air Force would be seriously impaired with a subsequent reduction in overall readiness, thus KC-135 flying hours have not been reduced to the levels suggested by this audit.

FLYING HOURS

QUESTION: Active Air Force flying hours are budgeted to increase by 74,000 hours in FY 1986. What percent of this increase is due to a larger inventory of aircraft and what portion to increased utilization?

ANSWER: Approximately seventy percent of the increase in flying hours is due to increases in aircraft inventory and thirty percent is due to increased utilization. The increased utilization supports the following requirements: increased hours to meet user requirements for operational taskings and air refueling training, maturing of the sortie generation capability of new and converting squadrons, additional instrument flight training for undergraduate pilot training students, and reimbursable training for foreign government students.

FREEZING FLYING HOURS

QUESTION: Considering that the Air Force funding request will have to be reduced to meet budget constraints would freezing flying hours at the FY 1985 level be an option that the Air Force would accept?

ANSWER: Freezing flying hours at the FY 1985 level would be detrimental to planned Air Force modernization programs and to programs that directly affect Air Force readiness levels. Approximately seventy percent of the increase in flying hours is due to increases in aircraft inventory and thirty percent is due to increased utilization. The increased utilization supports the following requirements: increased hours to meet user requirements for operational taskings and air refueling training, maturing of the sortie generation capability of new and converting squadrons, additional instrument flight training for undergraduate pilot training students, and reimbursable training for foreign government students.

COMMON STRATEGIC ROTARY LAUNCHER (CSRL) PROGRAM

QUESTION: What is the status of the Common Strategic Rotary Launcher (CSRL) program, specifically, the design and test flight portions?

ANSWER: The CSRL development and test program is on schedule and has no significant technical problems. The ground test program that began in November 1984 will be complete in July 1985. All but one major ground test has been completed. The flight test program will begin in August 1985. The test aircraft is currently being modified at the contractor's facility and will be delivered to Edwards AFB, California when complete. Approximately 20 sorties are planned through January 1986. ALCM, SRAM and gravity activity will be accomplished.

CSRL TEST PLAN AND SCHEDULE

QUESTION: Has the Air Force developed a test plan and schedule for the Common Strategic Rotary Launcher (CSRL) program as requested by the FY 1985 Appropriations Conference Report?

ANSWER: A comprehensive test plan and schedule for CSRL has been developed. A Test Program Outline was accomplished in July 1984 and revised in January 1985. A Test and Evaluation Master Plan was prepared and has been revised in February 1985. Highlights from these documents were presented to Congressional staffers during AF/RD sponsored "Staffer Days" in January 1985.

Questions Submitted by Senator Andrews

BOMB RACKS FOR THE F-15E

QUESTION: It has come to my attention that the Air Force is competing the acquisition of weapons delivery systems (bomb racks/ejector units) for the F-15E fighter. I am concerned about specific statements made regarding Western Gear Corporation's Division in North Dakota, and I would like to set the record straight.

Please describe the current competition and source selection process that the Air Force is going through to obtain the bomb racks for the F-15E?

ANSWER: The competition is actually for bomb ejector units rather than multi-position bomb racks which have embedded ejector units. The F-15E does not require bomb racks since weapons will be carried directly on aircraft stations. The Air Force has requested McDonnell Douglas Corporation conduct a competitive source selection for F-15E ejector units using specifications provided by the Air Force. McDonnell Douglas issued a Request for Proposal (RFP) on April 9, 1985. McDonnell Douglas will provide results of this competition to the Air Force in July 1985. The Air Force will make the decision as a result of the competitive source selection.

TWO LEVELS OF TECHNOLOGY

QUESTION: I understand there are two levels of technology requested by the RFP. Please explain. How will the decision be made to pick the winner?

ANSWER: There are two alternatives in the RFP. Both alternatives require ejector units with significant operational and logistics improvements not found on ejectors currently on Air Force fighters. The specifications for the first alternative include Air Force minimum requirements. The specifications for the second alternative include additional improvements which are highly desirable. Competitors may bid on either or both of these alternatives. McDonnell Douglas will evaluate cost and technical proposals and select a winner for each alternative. Without naming the respective winners, McDonnell Douglas will present cost and technical results to the Air Force. The Air Force will select an alternative based on cost, schedule, performance, and supportability considerations.

DENIAL TO POTENTIAL COMPETITORS

QUESTION: Have any potential competitors been denied the opportunity to compete as a result of the way the competition has been structured?

ANSWER: No. In fact, there may be more competitors and more intense competition as a result of the Air Force decision to consider proposals for both alternatives.

MA-1 INFRARED SYSTEM

QUESTION: Having determined there are sufficient F-4's with the longevity to last well into the year 2000, studies were conducted to determine what improvements would be required to give the aircraft a worthwhile air intercept capability. After careful analysis, it was concluded that a look-down/shoot-down infrared/radar sensor compatible with the latest configuration air-to-air armament was essential. The Fighter Weapons Office (FWO) was tasked to recommend F-4 improvements to satisfy the air defense mission requirements. Criteria established for systems to be added to the F-4 included meeting minimum operational/logistical requirements and being fully matured through operational use, procured under warranty by the manufacturer, and available for early retrofit. Concluding their study, the Fighter Weapons Office selected the AN/MA-1 infrared search and track systems, the AN/APG-63 radar, and interfacing avionic systems for the missionized F-4.

As I understand, the MA-1 infrared system was developed and produced in quantity specifically for the air defense aircraft. These systems and the logistical support equipment are surplus to Air Force requirements and are available for F-4 installation.

Is this understanding correct?

ANSWER: Yes, your understanding is correct. The MA-1 was developed for the Air Defense role and was installed in the F-106. There are MA-1 Infrared Search and Track (IRST) systems on the F-106 today and on F-106 aircraft in storage at Davis-Monthan. The MA-1 was not an effective system. It did not provide useful information due to the high number of false targets that it detected. The MA-1 could be made available for installation on a modified F-4; however, cost and schedule coupled with the unreliable nature of the MA-1 make such a modification program unattractive in terms of cost effectiveness and military utility.

APG-63 RADAR

QUESTION: I also understand that the APG-63 is a pulse doppler radar currently in production for the U.S. and its allies' F-15 aircraft and has been successfully tested against extremely small targets simulating cruise missiles. Engineering studies have also confirmed that the F-15 radar can be installed in the F-4 with no modification of the production hardware or software.

Is this also correct?

ANSWER: The current F-15 APG-63 pulse dopppler radar has been successfully tested against extremely small targets. Engineering studies have confirmed that the F-15 radar could be installed in the F-4. However, this modification would be extensive because the APG-63 is a digital system whereas the older F-4 is an analog system. Therefore, because of the cost involved, it might not be cost effective for the Air Force to modify the F-4 with the APG-63.

MISSIONIZING THE F-4

QUESTION: If this information is essentially correct, I have been briefed that a Statement of Need (SON) and a Modification Proposal Analysis (MPA) for this added capability are presently being drafted. Also, no RDT&E funds are required and that the modification effort will be managed by the Air Force logistics command.

Can we expect the Air Force to support this progress toward missionizing the F-4 for the strategic air defense role?

ANSWER: The F-4, as currently configured, is adequate to perform the strategic air defense mission today. However, the aircraft will soon approach the limits of maintainability and service life. As a consequence, the Air Force intends to complete modernization of the air defense force with conversion to F-16s in the near to mid-term. Proposals to further modify the F-4 must be viewed in this context. The SON for upgrading the F-4 has not been validated by the Air Force and at this time, because of the age of the aircraft, there are no plans to provide additional air defense capability modifications to the F-4.

Questions Submitted by Senator Kasten

F-16C COMPARABLE TO F-20 TIGERSHARK

QUESTION: In a recent hearing General Conaway of the Air National Guard said that the F-20 Tigershark had comparable capabilities in relation to the F-16A. This week, the New York Times published an article stating that the F-20 has the same armaments as an F-16 and has a more reliable engine.

What characteristics does the F-16C have which the F-20 Tigershark does not?

ANSWER: In some roles and under specific conditions, the F-20 offers capability and performance comparable to the F-16. In general, the F-16C will have a greater range and payload capability than the F-20 for typical air-to-air or air-to-surface missions. The F-16C will have full LANTIRN capability including laser designation, auto TF/TA, wide and narrow field of view FLIR with an auto-correlation feature for employment of Maverick missiles; the F-20 has provision for a FLIR navigation and attack system, an integral manual TA and provision for Maverick employment. The F-16C will have an internal ECM capability (ASPJ) while the F-20 may carry an external, conformally mounted ECM pod. Additional features in the radar, fire control and navigational systems generally favor the F-16C in terms of overall capability. Because of those areas where the aircraft offers comparable capability however, and because of the opportunity the F-20 program offers to interject competition into fighter procurement, we are continuing to examine the aircraft for possible introduction into our force structure where appropriate.

BUDGET FOR F-20 TIGERSHARK

QUESTION: The Air Force has a clear opportunity to introduce competition into this aircraft procurement. With two contractors providing competing fighters, both price and quality should improve. I would hope you consider any opportunity to put the F-20 into the budget as soon as possible.

There has been much talk about buying F-20s. Presently, there are no funds in the 1986 budget for F-20s. I hear that while you are now working on the program objective memorandum the F-20s are being considered for the 1987 budget.

1. What intention do you have of buying F-20s for the Air Force?

ANSWER: The statement that there are no funds currently in the FY86 budget for the F-20 is correct. The Air Force is very interested in introducing competitive fighter procurement in order to maximize available aircraft within the limitations of expected TOA. No decision on whether to buy the F-20 has been made at this time. However, we are investigating introduction of competitive fighter procurement for the FY 87 budget submission. This could well include the F-20.

QUESTION: Will their role be that of a tactical air warfare aircraft? What other role could F-20 be used for?

ANSWER: The Northrop F-20 remains a potential competitor for Air Force combat and training missions, such as Close Air Support/Battlefield Air Interdiction (CAS/BAI), Continental Air Defense, and Aggressor or Fighter Lead-in Training. The Air Force is currently evaluating the F-20's performance, cost, maintenance, and reliability data with regards to these missions.

QUESTIONS SUBMITTED BY SENATOR BYRD

RESPIRATOR AND PROTECTIVE CLOTHING PROGRAM

QUESTION: The Division of Safety Research of the National Institute of Occupational Safety and Health, which is located in Morgantown, West Virginia, performs state of the art research and testing on respirators and chemical protective clothing. This division is also the National Reference Laboratory for Respirator Certification of Commercial Respiratory Protective Devices of all types.

As a matter of fact, the expertise of this facility has been sought by the Department of the Army and the Department of the Air Force in both areas of respirators and chemical-biological defense ensemble development.

It is my understanding discussion has taken place between the Department of the Air Force and the Division of Safety Research on establishing a pilot program of two or three years duration in which Air Force life support personnel would participate. This program would focus on those areas of mutual interest relating to respirators and protective clothing.

It would appear that much of the methodology developed by the Division of Safety Research would be applicable to the needs of the Department of Defense, and such a program could be mutually beneficial.

I would hope that such a pilot program could be established. Would you explore this possibility and report back to me on your findings?

ANSWER: The Air Force has recently been in communication with the office of Mr John Moran, Director of the Division of Safety Research, regarding such a proposed exchange. Mr Moran has drafted the details of the proposed program. From our preliminary discussions we believe that the appropriate Air Force agency for this exchange would be the Aerospace Medical Division (AMD), Brooks AFB, Texas.

AMD will continue to work with the Division of Safety Research to discuss the applicability of their respective areas of interest to such a joint personnel or information exchange.

F-20 FOR RESERVE AND GUARD UNITS

QUESTION: What are your views regarding the Northrop Corporation's proposal to sell the F-20 aircraft to the Air Force for use by Reserve and Guard units?

ANSWER: Northrop's proposal may offer an opportunity to introduce competition into USAF fighter procurement. As the FY 87 budget is prepared, the Air Force is evaluating Northrop's proposal and studying potential roles for the F-20 in both the Active and Reserve Forces.

CAPPED M-X MISSILE

QUESTION: If the deployment of the M-X missile were to be capped at 40, how many missiles would such a program require in total and what would be the reason for the procurement of those in excess of 40? Answer in some detail please?

ANSWER: With a 40 missile deployment, the Peacekeeper program would require a total of 163 missiles: 40 for deployment, 108 for Operational Test Program and 15 for Aging and Surveillance.

The size of the Operational Test Program is statistically derived to meet Joint Chiefs of Staff requirements and is independent of the number of missiles deployed, 40, 50, or 100. The Operational Test Program is divided into two phases; Phase I will launch 24 missiles, 8 per year for the first three years, to establish system accuracy and reliability for the Single Integrated Operations Plan. Phase II will launch 84 missiles, 7 per year, over the remaining 12 years of the system life cycle.

The purpose is to verify the continued performance and reliability of the weapon system.

The Peacekeeper Aging and Surveillance program will use 15 missiles, one per year, to predictively detect aging trends and any potential system degradation. This practice allows for corrective action to be taken before system performance is degraded. Past Aging and Surveillance monitoring experience with the Minuteman program, which uses three Aging and Surveillance assets per year has been instrumental in maintaining weapon system reliability over time.

The required number of missiles for the Peacekeeper Operational Test Program and Aging and Surveillance program is proportional to past U.S. programs; Minuteman I, II, and III, and has fewer launches per year than Trident, 20 per year, and Pershing II, 12 per year.

WASHINGTON POST ARTICLE REGARDING CONTRACTORS

QUESTION: A report in the Washington Post of April 21, 1985, indicates that an Air Force investigation of six of the Nation's largest defense contractors in 1983 and 1984 showed "evidence of pervasive inefficiency and sloppiness in the production of aircraft, missiles and other weapons." The clear implication of the studies is that the procurement of these expensive systems could be accomplished with reduced funding levels. Indeed, the report indicates that the Deputy Secretary of Defense asserted in 1983 that shoddy work adds 10 to 30 percent to the cost of these systems. Last September, the report continues, former Under Secretary of Defense for Research and Engineering, Mr Richard De Lauer, told the contractors that "the no. 1 weakness" of the Defense Department is the "poor workmanship" of the weapons manufacturers. I asked that this piece be included in the hearing record at this point.

Would you please comment on this article?

Would you please supply me with copies of the reports to which the Washington Post article refers?

ANSWER: We disagree with the statement in the article that the investigation showed "evidence of pervasive inefficiency and sloppiness in the production of aircraft, missiles, and other weapon systems". We cannot discuss the details because the findings of the reviews have been determined not to be releaseable information under the provisions of the Freedom of Information Act. We have, however, provided a detailed briefing on the subject to Senators Quayle and Levin in closed session. That same briefing can be made available to you. The documentation you requested will be provided separately because of its restricted use.

(The Washington Post article follows:)

THE WASHINGTON POST, April 22, 1985

Air Force Found Inefficiency At Six Weapons Contractors

Firms' Own Work Standards Often Unmet

By Rick Atkinson and Fred Hiatt
Washington Post Staff Writers

An Air Force investigation of six of the nation's largest defense contractors in 1983 and 1984 found evidence of pervasive inefficiency and sloppiness in the production of aircraft, missiles and other weapons, according to documents obtained by The Washington Post.

The investigation of about five weapons systems produced by each of the contractors found that the companies frequently took two or three times longer to build weapons than called for by the contractors' own work standards. Much of the extra effort went into components that failed inspection and had to be reworked or discarded.

The studies suggest that the Defense Department could buy the same number of weapons for substantially less money if contractors operated closer to their own efficiency targets. The documents also support a 1983 assertion by Paul Thayer then deputy defense secretary, that shoddy work adds 10 to 30 percent to the cost of U.S. arms.

Richard D. DeLauer, former undersecretary of defense for research and engineering, last September warned a group of contractors that "the No. 1 weakness" of the Defense Department "is the poor workmanship" common to a great cross-section of weapons rolling off assembly lines.

"What we have is just crappy, shoddy workmanship," DeLauer said, according to Defense Week.

Industry spokesmen and some Pentagon officials, however, say the Air Force studies paint an incomplete picture of contractor efficiency and competence. They argue that the documents fail to account for recent changes intended to sharpen productivity or for inefficiencies caused by government requirements, such as frequent changes in weapons design.

The Defense Department's alarm over the productivity and quality of its arms makers came to a head more than two years ago after an investigation of the Hughes Aircraft Co. plant in Tucson uncovered "undisciplined work habits and lax management," according to congressional testimony by Major Gen. Bernard L. Weiss, chief of Air Force contracting policy.

The Air Force found that Hughes took 17 times longer than the company said it should to build the Maverick missile. Air Force auditors also concluded that Hughes "perpetuates inefficiency by hiring four to five times" as many workers as it needed, documents show.

After the military temporarily stopped accepting its missiles, Hughes devised a "get-well" plan that the Air Force says should correct the shortcomings.

But the problems at Hughes prompted Air Force Secretary Verne Orr in May 1983 to order studies of five other major firms: the Boeing Co., General Dynamics Corp., Lockheed Corp., the Pratt & Whitney division of United Technologies Corp. and Raytheon Corp. The Air Force found serious inefficiencies in at least some weapons systems being produced at all five firms, according to the documents.

Air Force officials declined to make the studies available, saying they could be "misinterpreted" or prove embarrassing to the contractors. The documents, briefing papers of 25 to 35 pages each, were obtained independently.

They show that at Raytheon, for example, workers took almost four times longer than the company estimated they should to build Aegis radar components for Navy ships.

For every 100 hours the company should have needed to build a radar, almost 35 were spent building parts that had to be scrapped or repaired, Air Force documents show.

A Raytheon spokesman had no comment last week on the study, except to note that the Aegis is "a complicated shipboard system."

Similarly, on a contract to build J52 engines for Navy A6 planes, Pratt & Whitney worked three hours for every hour that its engineers said it should during 1983, a worse record than it compiled five years earlier on the same engine. The company spent almost half as much time on scrap and rework as it should have spent building the engines.

Tom Drohan, Pratt & Whitney's vice president for public relations, noted that the Air Force study also had praised the company for its "commitment to productivity improvement," including plans for greater capital investment. He said the actual time spent on reworking parts of the J52 is a tiny fraction, about 2 percent, of the total effort on the engine.

The Air Force study showed, however, that scrap, rework and repair accounted for 15.5 percent of the hours Pratt & Whitney devoted to the J52 engine and for 46.1 percent of the hours the company would have spent if it had worked at target efficiency.

General Dynamics took two hours for every hour its engineers said it should on its Tomahawk missile and KC10 refueling aircraft, and almost four times longer than its efficiency target on Atlas rocket contracts, according to the Air Force study completed in early 1984.

"Since 1983, considerable improvement in performance, scrap and rework has been made across the board on the Tomahawk, KC10 and Atlas programs," General Dynamics spokesman Alvin Spivak said.

"Our overall conclusion was that, on some of these programs, certainly the contractors were not as efficient as we'd like them to be," said one Air Force official, who asked not to be identified. "So we've adjusted our policy to negotiate a very tight budget at the outset of a contract to force the contractor to stay within that budget."

All five companies, including Raytheon and Pratt & Whitney, performed much better on some systems, and Lockheed Corp.'s Georgia plant performed with relative efficiency on almost all contracts. None of them reached their efficiency targets, however.

As a result of the study's findings Gen. Lawrence A. Skantze, commander of Air Force Systems Command, last September ordered the Air Force to negotiate contracts based on what a weapon should cost, not on what history shows it is likely to cost.

"We're not going to pay for previous inefficiency anymore," one of Skantze's aides said. The official said it is too soon to say whether the new policy is having an effect.

The official also said that companies tend to perform better on mature programs, weapons without complex electronics and programs in which the Pentagon is buying sufficient numbers of items. Boeing, for example, performed poorly on the Roland missile, which was canceled early in its life, but came close to its target efficiency on the air-launched cruise missile.

Boeing spokesman Bill Rice said that under Pentagon procurement rules, most firms establish a "standard" hour, which is based on calculations by the company's industrial engineers of how much work an efficient plant should accomplish. "The potential to attaining the standard only comes after working on the program for some time," Rice said.

For example, he said, Boeing took 5,500 hours to build the first air-launched cruise missile, but only 1,000 hours to build missiles that came off the line a year later.

SUBCOMMITTEE RECESS

Senator STEVENS. The hearing is recessed until May 2 when we will take up the Navy aircraft program.

[Whereupon, at 11:45 a.m., Thursday, April 25, the subcommittee was recessed, to reconvene Thursday, May 2, 1985.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

WEDNESDAY, MAY 7, 1985

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met, at 10 a.m., in room SD-192, Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Andrews, Kasten, D'Amato, Rudman, Proxmire, and Sasser.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE AIR FORCE

STATEMENTS OF:

HON. EDWARD C. ALDRIDGE, JR., UNDER SECRETARY OF THE AIR FORCE

BRIG. GEN. DONALD J. KUTYNA, DIRECTOR, SPACE SYSTEMS AND C-3, DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION, HEADQUARTERS, U.S. AIR FORCE

SPACE PROGRAMS

BUDGET REQUEST

Senator STEVENS. We are here this morning to review Air Force space programs for fiscal year 1986. The total budget for all DOD space-related programs is $12.2 billion. This is an increase of $700 million over appropriations to date for the current fiscal year.

Today we will review such programs as the complementary ELV—for which the Air Force has a pending reprogramming of $30 million before our committee—as well as other space-related programs such as the anti-satellite program, the Milstar satellite, upper stage programs and the proposal to convert Titan II ICBM's to space boosters.

COMPARATIVE STATEMENT OF BUDGET AUTHORITY

For the record, we would like to have the Air Force submit a comparative statement of budget authority for all its space programs by appropriation account for the fiscal years 1984 to 1986. This display should include real growth calculations based on the latest economic indicators.

[The information follows:]

STATEMENT OF BUDGET AUTHORITY

The Air Force Space and Space Related Budget is composed of over two hundred individual budget line items. In many cases, only a portion or factor of a budget line item is included in the Air Force Space Budget, since only a portion of the line may be designated space related. The Air Force does not use the Space Budget breakout to manage or make future decisions with respect to force structure or acquisition programs. Air Force Space and Space Related programs compete with other Air Force programs on an even basis and only those missions which can be accomplished more effectively and/or at lower cost are transitioned to space. The following illustration tracks the Air Force Space Budget by appropriation account. Real growth in the space area is slowing just as real growth is slowing for the entire Air Force budget. The actual percent of Total Obligation Authority for Space has remained relatively constant.

21 MAY 85

COMPARATIVE STATEMENT OF BUDGET AUTHORITY FOR AIR FORCE SPACE PROGRAMS
($s IN MILLIONS*)

APPROPRIATION	FY 84	FY 85	FY 86 REQUEST	FY 84** INDEX	FY 85** INDEX	FY 86** INDEX	FY 84 TO FY 85 REAL GROWTH	FY 85 TO FY 86 REAL GROWTH
RDT&E	3,140	3,580	4,040	1.023	1.063	1.109	9.7%	8.2%
APAF	20	40	100	1.096	1.159	1.219	89.1%	137.7%
MPAF	2,350	2,840	3,080	1.091	1.145	1.206	15.2%	3.0%
OPAF	1,230	1,610	1,570	1.065	1.109	1.154	25.7%	-6.3%
O&M	1,010	1,330	1,630	1.013	1.053	1.099	26.7%	17.4%
MILCON	160	80	100	1.073	1.118	1.163	-52.0%	20.2%
MILPERS	250	400	430	1.000***	1.048***	1.101***	52.7%	2.3%
TOTAL	8,160	9,880	10,950	1.048****	1.093****	1.143****	16.1%	6.0%
% of AF TOA *****	9.0%	9.9%	9.9%					

* ROUNDED TO THE NEAREST $10 MILLION

** USAF WEIGHTED INFLATION INDEX BASED ON OSD RAW INFLATION AND OUTLAY RATES WITH A BASE YEAR OF FY 1984 EXCEPT AS NOTED

*** USAF RAW INFLATION INDEX

**** WEIGHTED WEIGHTED INDEX

***** TOA INCLUDES RETIRED PAY ACCRUAL

INTRODUCTION OF WITNESSES

Senator **STEVENS**. We have requested that this be an open hearing, and we would encourage all members to keep their questions unclassified. To the extent to which we will request answers for classified matters, we will submit questions to the Department for the record, or if required, we will schedule a later classified hearing.

Our witnesses for today's hearing are Edward C. Aldridge, Under Secretary of the Air Force, and Brig. Gen. Donald J. Kutyna, Director Space Systems and C-3, Headquarters, U.S. Air Force.

We will put your complete written statements in the record. We would ask you to briefly summarize your remarks in your opening statements.

Mr. Aldridge, General Kutyna, welcome to the committee. We are pleased to have both of you here with us this morning. This is a very important program to administer. We all have a great interest in it.

Gentlemen, are there any statements?

[No response.]

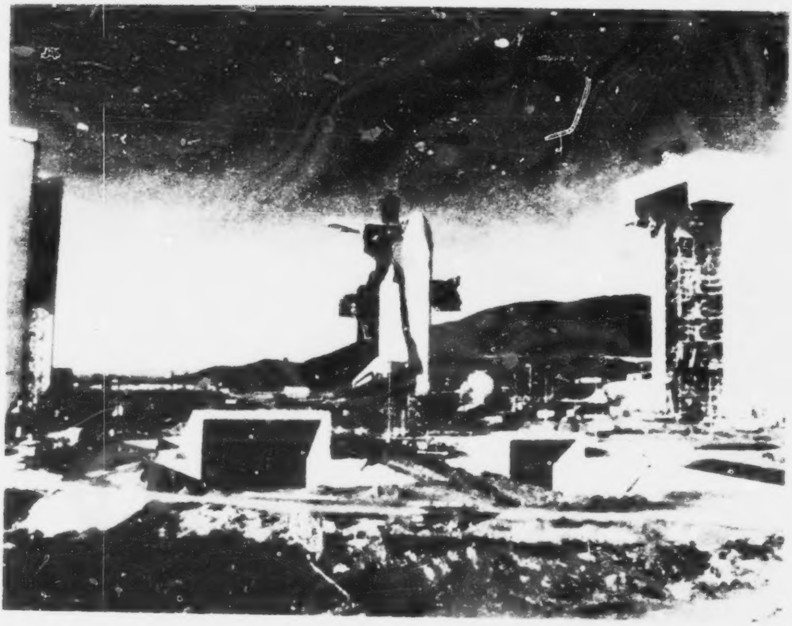
Senator **STEVENS**. Mr. Aldridge, please proceed.

VIEWGRAPH PROGRAM

Mr. **ALDRIDGE**. Thank you, Mr. Chairman.

Mr. Chairman, we plan a two-part program this morning. I will summarize my prepared statement for you in 10 or 15 minutes with a series of viewgraphs and General Kutyna will be prepared to respond to specific questions on the overall Space Program.

The first chart, please.



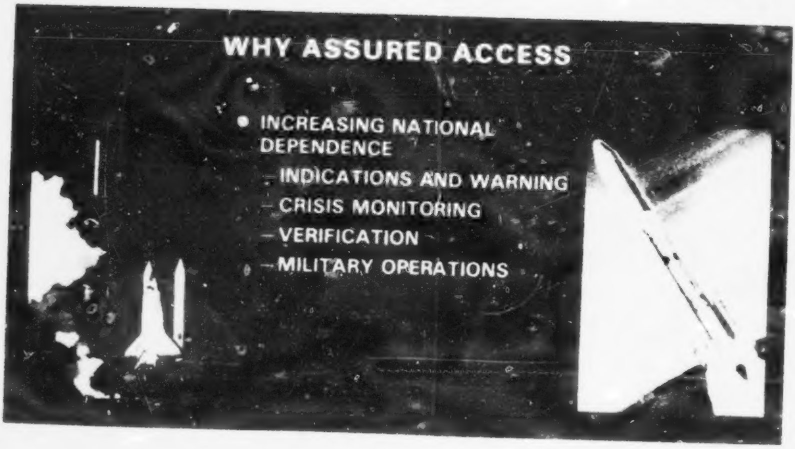
SLIDE 1

STATUS OF VANDENBERG AFB CONSTRUCTION

Mr. ALDRIDGE. Mr. Chairman, to digress briefly, to show you the degree of partnership that exists between the Air Force and NASA, this is the status of the construction of Vandenberg Air Force Base in California.

It shows the Enterprise with the tank and solid rocket boosters mounted on the launch pad at Vandenberg. We are scheduled to have that pad available for launch by October 15 this year with the first scheduled launch March 20 next year.

We are proceeding very well on that program and we are quite proud of the progress that has been made at Vandenberg.



WHY ASSURED ACCESS

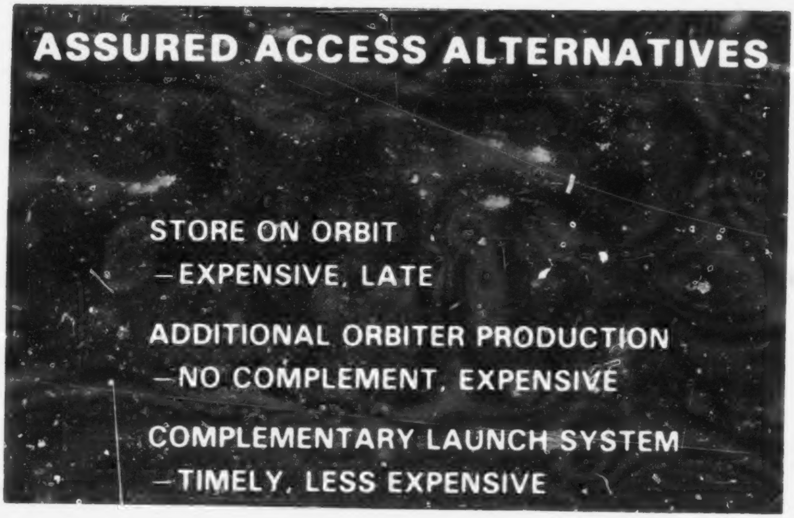
- INCREASING NATIONAL DEPENDENCE
  - INDICATIONS AND WARNING
  - CRISIS MONITORING
  - VERIFICATION
  - MILITARY OPERATIONS

SLIDE 2

COMPLEMENTARY EXPENDABLE LAUNCH VEHICLE

Mr. ALDRIDGE. Mr. Chairman, I would like now to turn to our request for the complementary expendable launch vehicle. As you know and as your statement says, the Department of Defense is increasing its dependence on space to support its national security objectives.

We are spending about $8 billion to $10 billion a year on the satellite programs and we need to ensure that the same degree of importance exists to launch those satellites as we are placing on the satellites themselves and we need to press on with making sure we have an assured way to get to space.



ASSURED ACCESS ALTERNATIVES

STORE ON ORBIT
—EXPENSIVE, LATE

ADDITIONAL ORBITER PRODUCTION
—NO COMPLEMENT, EXPENSIVE

COMPLEMENTARY LAUNCH SYSTEM
—TIMELY, LESS EXPENSIVE

SLIDE 3

ALTERNATIVES TO LAUNCH VEHICLES

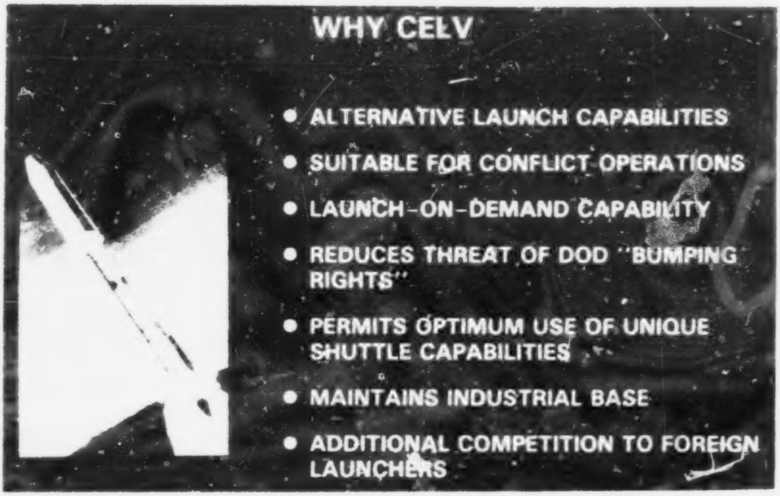
Mr. ALDRIDGE. We were concerned that a fleet of only four orbiters was the path that we were taking to get to launch our space vehicles. This made us look at some other alternatives. We did look at several alternatives for assurance of getting into space in a responsive and timely manner.

We looked at store on orbit where you launch satellites when your launch vehicles are available and store them on orbit until the time comes to use them. We found that extremely expensive because the satellites do degrade in orbit and we could not get those systems into orbit when we needed them. It would be 5 to 6 years in the future when that could be provided.

ADDITIONAL ORBITER PRODUCTION

We looked at the additional orbiter production and buying the fifth orbiter. We found that was not a complement to getting into space, but in fact if the orbiter fleet was grounded for some technical reasons, the entire fleet would be grounded.

Our final solution was to go to a complementary ELV. We found that was, in fact, timely and would meet our requirements and was less expensive. We think the best way to get assured access to space is a combination of the four orbiters we currently have fully utilized as well as a small number of complementary ELV's and that is what our program recommends.



WHY CELV

- ALTERNATIVE LAUNCH CAPABILITIES
- SUITABLE FOR CONFLICT OPERATIONS
- LAUNCH-ON-DEMAND CAPABILITY
- REDUCES THREAT OF DOD "BUMPING RIGHTS"
- PERMITS OPTIMUM USE OF UNIQUE SHUTTLE CAPABILITIES
- MAINTAINS INDUSTRIAL BASE
- ADDITIONAL COMPETITION TO FOREIGN LAUNCHERS

SLIDE 3

REASONS FOR CELV

Mr. ALDRIDGE. Ask the question why, why do we proceed with the complementary ELV. It does provide for alternative launch capability. If for some reason the orbiter fleet was gounded for technical problems or we damaged one on landing or takeoff, our access to space would be severely limited.

CELV ALTERNATIVE

This would provide us with an alternative to the orbiter fleet that would be complementary. It is also suitable for conflict conditions when the country may not want to launch a manned system into space. With a military satellite we at least have a capability to get to space with an unmanned system and perhaps it could be a better solution in a conflict or in crisis condition.

LAUNCH ON DEMAND

It does provide capability for launch on demand. In that sense the satellite and the booster are mated and when the satellite is ready to go, the booster is ready to go as opposed to having a fleet of orbiters with a manifest schedule that exists years into the future where we would be able to avoid the problem of having to bump a shuttle mission if for some reason we had to get to space in a rapid manner.

We believe that reduces the threat of bumping and would encourage more people to come on the shuttle if the demand for bumping is reduced by DOD. It permits the optimal use of the shuttle.

In many missions we don't require a man in the system. Going to geosynchronous orbits, an unmanned system does fine. In other conditions where man is required, such as repair, refurbishment, recovery, reuse of some of these satellites, that is where we would optimize the shuttle for that purpose.

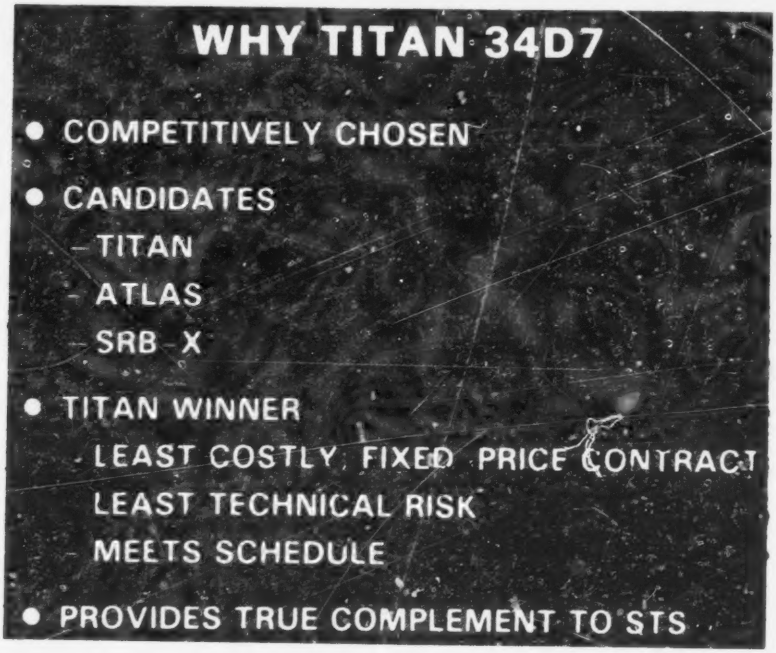
INDUSTRIAL BASE

It also maintains the industrial base. Pretty soon the production for Titans and Atlases will dry up. We at this point in time have no production plans for the fifth orbiter.

Unless we maintain the space-launch industrial base, our capability to get to space is going to be severely restricted. We need that industrial base for the competition it provides and for planning for the future.

COMPETITION

We believe also that once we have this complementary ELV, it will give us the capability to compete with ARIANE since we will have a shuttle as well as ELV to compete with ARIANE. At this point shuttle is only one.



WHY TITAN 34D7

- COMPETITIVELY CHOSEN
- CANDIDATES
  - TITAN
  - ATLAS
  - SRB-X
- TITAN WINNER
  - LEAST COSTLY, FIXED PRICE CONTRACT
  - LEAST TECHNICAL RISK
  - MEETS SCHEDULE
- PROVIDES TRUE COMPLEMENT TO STS

SLIDE 5

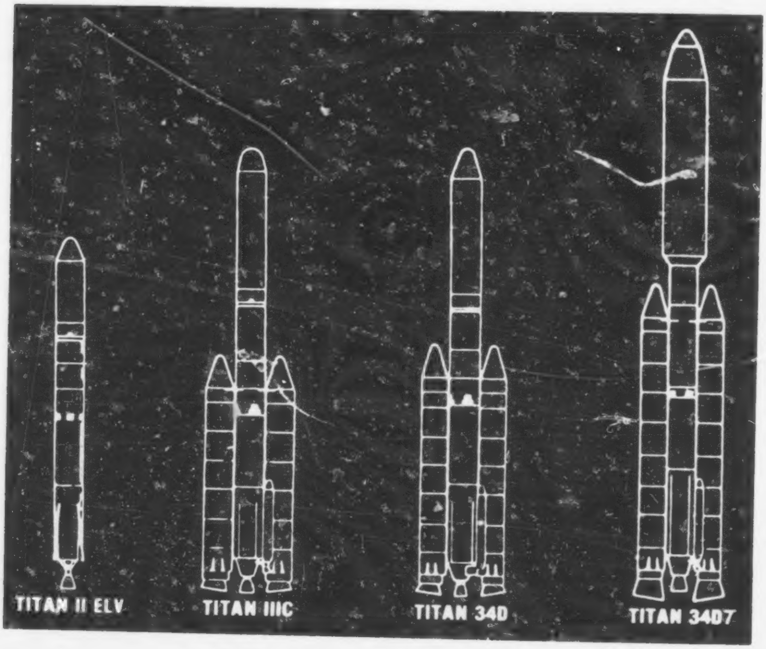
TITAN DERIVATIVE

Mr. ALDRIDGE. We have picked, through competition, the Titan 34D7, which is a derivative of the existing Titan 34D. We looked at the Titan derivative and at the Atlas derivative and a shuttle derivative which we call SRB-X using solid rocket boosters.

We went through a two-part competition, competing the Altas and Titan with each other. Titan won that competition.

Then we competed the Titan with SRB-X and the Titan also won that competition. It was least costly. Martin-Marietta had provided us a fixed-price contract for launching the 10 ELV's. It was the lowest technical risk and it meets our schedule for 1988 launch.

By being a separate system, it is truly complementary to the orbiter.



SLIDE 6

BOOSTER CAPABILITIES

Mr. ALDRIDGE. To show you the capabilities of the various boosters that we were just talking about—at the end we will show you the Titan II. The Titan III-C which is the older vesion of the Titan III, the 34D which we are currently flying and Titan 34D7 which is the proposal for the complementary ELV.

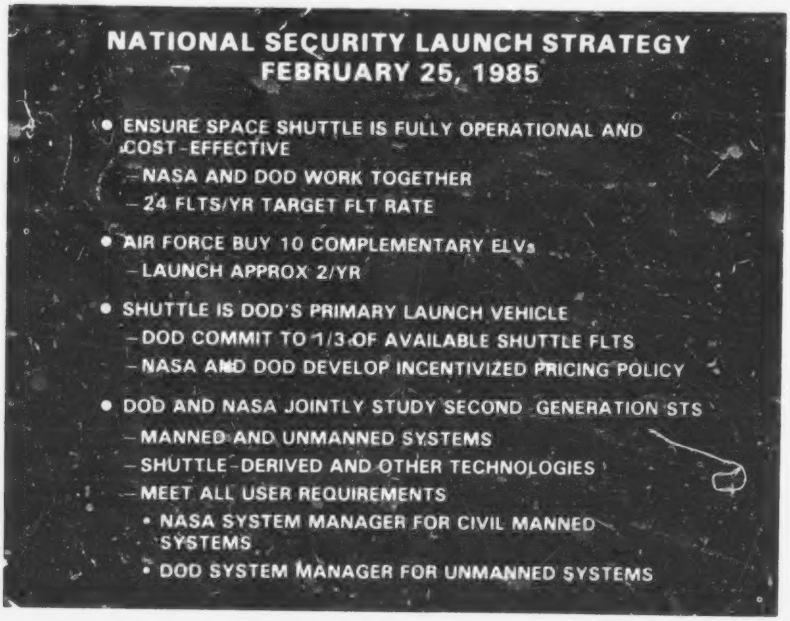
You can see our design requirements were that it had to be able to lift the same payload volume and weight as the current orbiter can which to us was 10,000 pounds to geosynchronous orbit.

You see the upper part of the booster includes the diameter of the shuttle as well as the length.

Senator STEVENS. You use 34D then?

Mr. ALDRIDGE. 34D7. The difference is that it uses the 7-segment solid rocket on the side as opposed to the 5 segment.

Incidentally, those 7-segment solid rocket motors have already been test fired as part of the MOL Program. We test fired those solid rockets four times and the last three were completely successful. It is basically an upgrade of Titan 34D.



NATIONAL SECURITY LAUNCH STRATEGY
FEBRUARY 25, 1985

- ENSURE SPACE SHUTTLE IS FULLY OPERATIONAL AND COST-EFFECTIVE
  - –NASA AND DOD WORK TOGETHER
  - –24 FLTS/YR TARGET FLT RATE
- AIR FORCE BUY 10 COMPLEMENTARY ELVs
  - –LAUNCH APPROX 2/YR
- SHUTTLE IS DOD'S PRIMARY LAUNCH VEHICLE
  - –DOD COMMIT TO 1/3 OF AVAILABLE SHUTTLE FLTS
  - –NASA AND DOD DEVELOP INCENTIVIZED PRICING POLICY
- DOD AND NASA JOINTLY STUDY SECOND GENERATION STS
  - –MANNED AND UNMANNED SYSTEMS
  - –SHUTTLE-DERIVED AND OTHER TECHNOLOGIES
  - –MEET ALL USER REQUIREMENTS
    - NASA SYSTEM MANAGER FOR CIVIL MANNED SYSTEMS
    - DOD SYSTEM MANAGER FOR UNMANNED SYSTEMS

SLIDE 7

NATIONAL SECURITY LAUNCH STRATEGY

Mr. ALDRIDGE. Mr. Beggs and I worked over a period of several weeks to try to resolve some of the differences that existed, most of them a misunderstanding between the Air Force, DOD, and NASA and we reached an agreement.

That agreement culminated in assigning by the president of the National Security Launch Strategy, February 25, 1985, which basically goes through the parts of that agreement.

One is that we will continue to work with NASA to make sure the shuttle is a fully operational and cost-effective system and we will aim at achieving 24 flights per year which is the NASA goal.

The Air Force would buy the ten complementary ELV's and launch them at the rate of approximately two per year.

The shuttle would remain the DOD's primary launch vehicle. We would commit to the shuttle and to ensure that we were not falling off the orbiter, we would commit to one-third of the total available flights on the orbiter per year and we would redevelop a new pricing policy for those flights that would give positive incentive for DOD to continue to fly the orbiter.

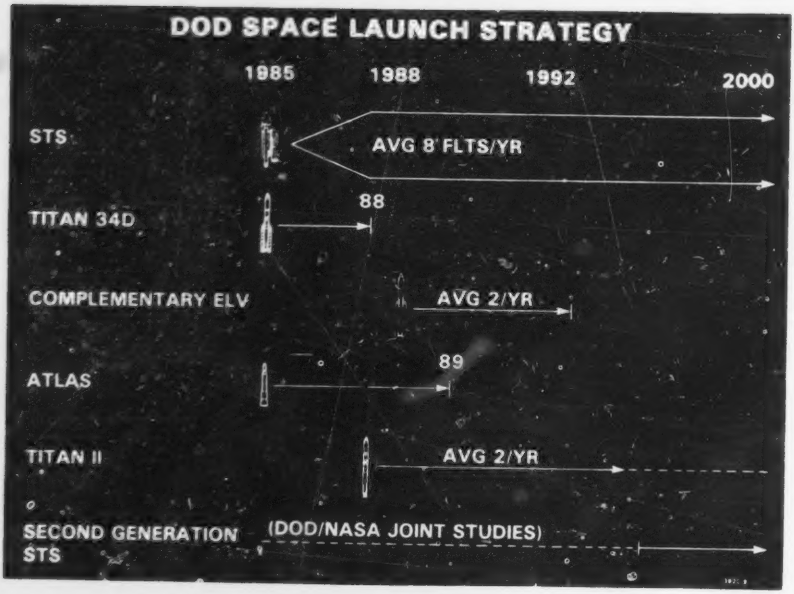
That pricing policy is now being worked on.

SECOND GENERATION TRANSPORTATION SYSTEM

Then to get on with the future, we would agree to study a second generation transportation system. It doesn't mean second generation shuttle, but a second generation space transportation system which would consist of both manned and unmanned vehicles that would meet our future requirements as we define them over the next few years.

We had no requirements from the studies that would exeed the launch capability of the shuttle or the complementary ELV, but we know that as we look forward to the space station, or the strategic defense initiative or future satellite systems with improved survivability, we probably will exceed the current launch capacity, launch weight, of the shuttle and the ELV.

Incidentally, all of this was agreed and in order to change this agreement, we would have to go back to the President for revision with a revised plan. We think this is a good plan. I believe it has set a spirit of cooperation between ourselves and NASA and we are happy to get on with such a plan, sir.



DOD SPACE LAUNCH STRATEGY

1985 1988 1992 2000

STS — AVG 8 FLTS/YR

TITAN 34D — 88

COMPLEMENTARY ELV — AVG 2/YR

ATLAS — 89

TITAN II — AVG 2/YR

SECOND GENERATION STS — (DOD/NASA JOINT STUDIES)

SLIDE 8

DOD LAUNCH STRATEGY

Mr. ALLDRIDGE. To show you what the results of that plan were this is what DOD launch strategy will look like to the year 2000. Basically flying eight flights a year on the shuttle. That is an average. It is probably a minimum.

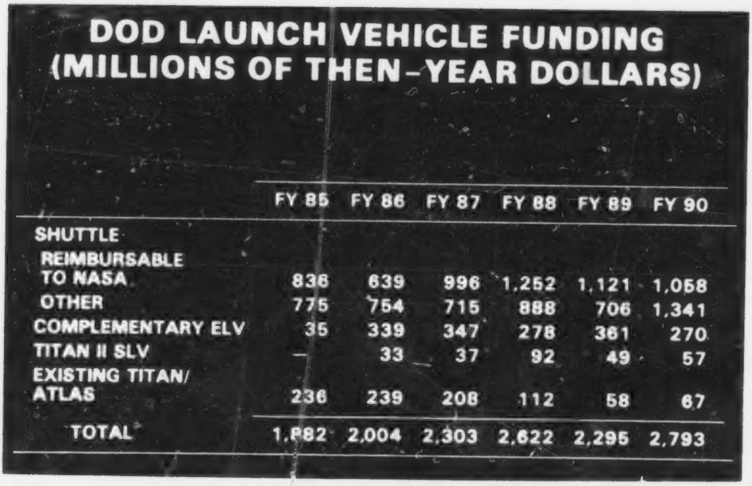
There is a possibility that we could even increase that if we see our requirements grow in the future.

The Titan 34D will end its flight rate in 1988. The production is essentially ending now on the ability to produce the Titan vechicle. Unless we have the complementary ELV, that production base will dry up.

You see the complementary ELV coming in in 1988, flying at a rate of two per year through 1992.

The current Atlases and II's that we have will fly out in 1989 and we are planning to use the Titan II, a refurbished Titan II ICBM, starting in early 1988. We plan to fly an average of about two per year on that program.

Then lastly, we would hope that the joint DOD-NASA study would result in some type of second generation system coming in in the mid-1990's, that we could use to meet future requirements for ourselves, NASA, and commercial users.



DOD LAUNCH VEHICLE FUNDING (MILLIONS OF THEN-YEAR DOLLARS)

	FY 85	FY 86	FY 87	FY 88	FY 89	FY 90
SHUTTLE						
REIMBURSABLE TO NASA	836	639	996	1,252	1,121	1,058
OTHER	775	754	715	888	706	1,341
COMPLEMENTARY ELV	35	339	347	278	361	270
TITAN II SLV	—	33	37	92	49	57
EXISTING TITAN/ ATLAS	236	239	208	112	58	67
TOTAL	1,882	2,004	2,303	2,622	2,295	2,793

SLIDE 9

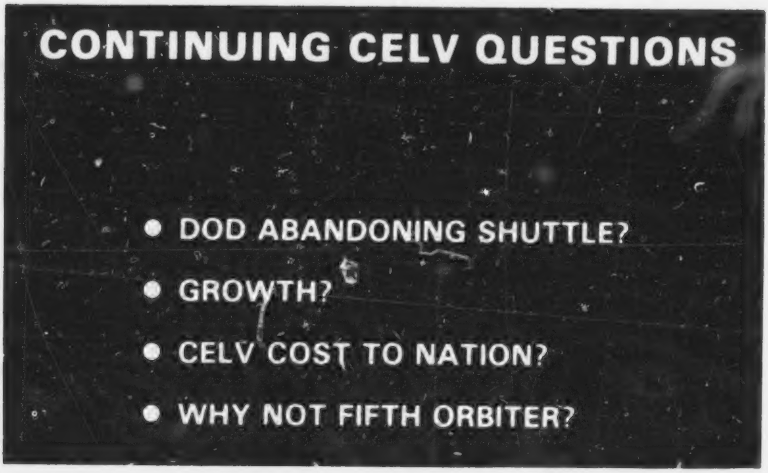
LAUNCH VEHICLE FUNDING

Mr ALDRIDGE. This chart summarizes the amount of money that we are putting into the launch vehicle program. You mentioned the number of about $1[illegible] billion a year in space. We are going to spend about $2 billion of that money for the launch vehicles that go along with it. This includes those funds which are reimbursable to NASA based on pricing policy, the changes which are basically things like operation at Vandenberg and finishing the construction.

You see the complementary ELV program with $35 million requested in 1985. Thirty million of that is part of the reprogramming package, with $339 million in 1986.

The Titan II space-launch vehicle, conversion starts in 1986 with $33 million, flying out the existing Titans and Atlases, accounts for the operating cost added to finish up these programs.

Launch vehicle funding is running to almost $3 billion a year through the next 5 years.



CONTINUING CELV QUESTIONS

- DOD ABANDONING SHUTTLE?
- GROWTH?
- CELV COST TO NATION?
- WHY NOT FIFTH ORBITER?

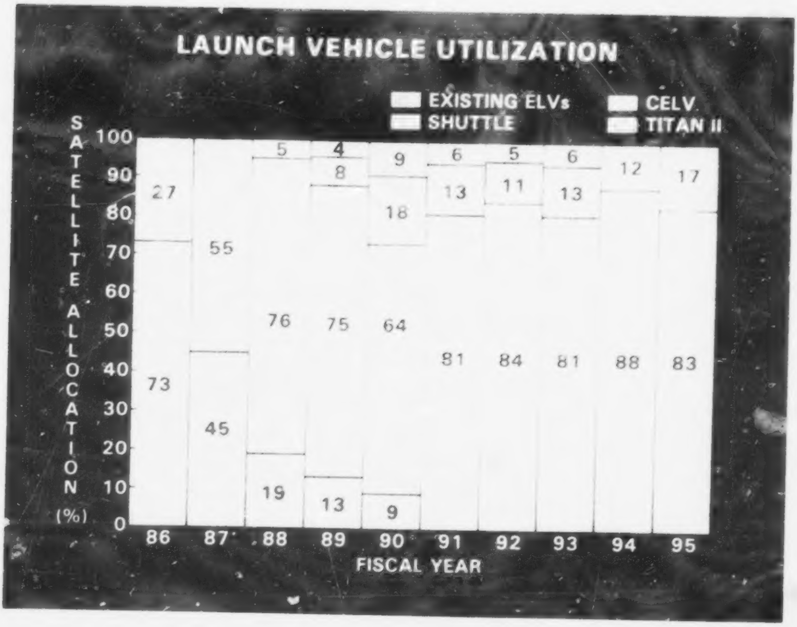
SLIDE 10

CELV PROGRAM QUESTIONS

Mr. ALDRIDGE. In spite of all this, there are continuing nagging questions asked about the CELV program. The issue of abandoning the shuttle. What about the growth potential in the future?

What about the cost of the complementary ELV to the Nation? At a contract cost of about $2 billion, is that really worth it? Why not the fifth orbiter as opposed to buying the CELV?

I will address each of these.

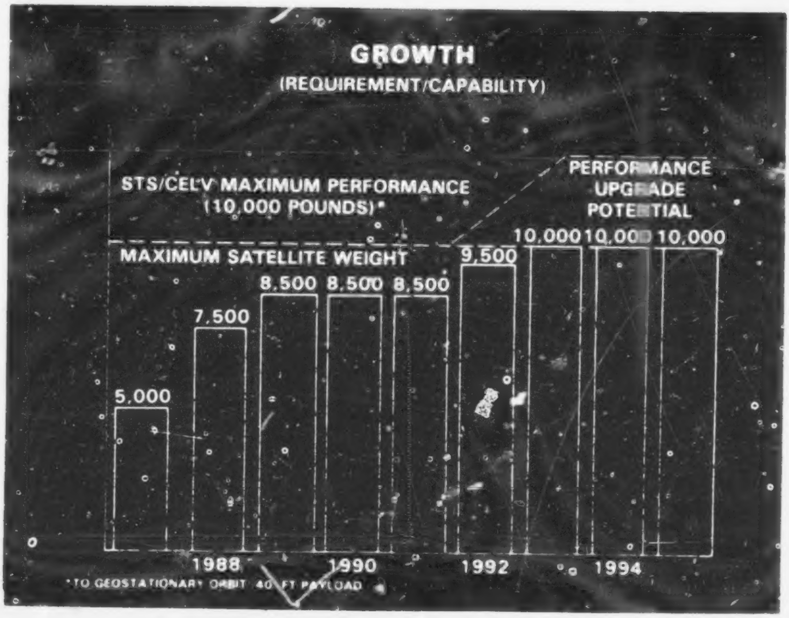


SLIDE 11

LAUNCH VEHICLES UTILIZATIONS

Mr. ALDRIDGE. First, on utilization, this chart shows the utilization of DOD satellites on the various launch vehicles. You can see with the red as we phase down the Atlas, existing Atlases and Titans, that we will go to zero and we will begin phasing in CELV and Titan II.

These are percentages of the total DOD satellites we plan to fly on the various vehicles. As you can see, 80 percent or greater of the total DOD satellites will continue to fly on the orbiter. That is where we get the eight flights per year on the orbiter that we have committed to with NASA and, of course, approved by the President.



Slide 12

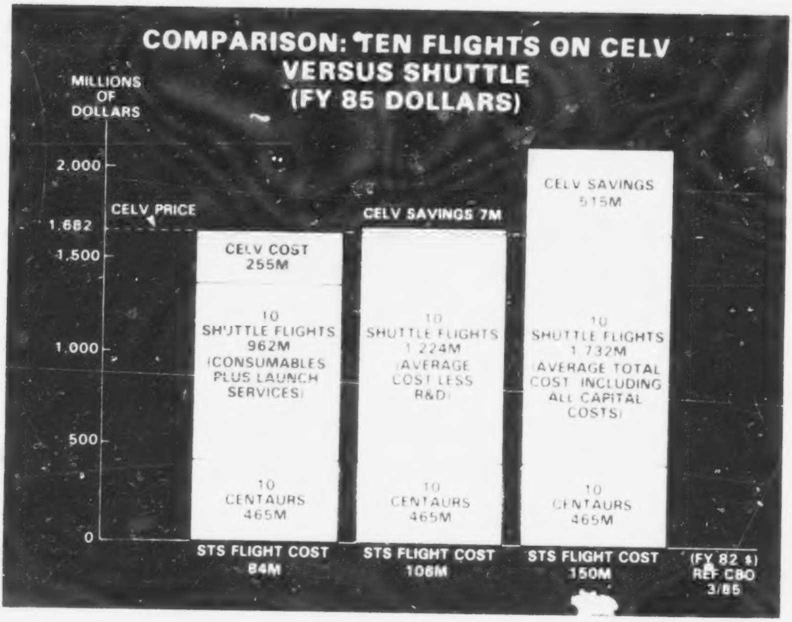
GROWTH POTENTIAL

Mr. Aldridge. The next chart addresses the issue of growth potential. We set a goal for the ELV program of 10,000 pounds to geosynchronous orbit, which is the capacity of the current shuttle.

We have no requirements that exceed the 10,000 pounds to geosynchronous orbit, as you can see by the chart showing the various satellite weights growing to about 10,000 pounds in the early 1990's.

We do have a capability to upgrade that titan 34D7 to meet additional requirements, but we don't see any of those requirements coming now.

Incidentally, 10,000 pounds is the maximum for the shuttle, as I mentioned before. So, we believe we have sufficient growth potential to meet all our identified requirements until the mid-1990's and if we need any capabilities beyond that point, we hope that the DOD-NASA studies will address those requirements.



SLIDE 13

CELV PROGRAM COST

Mr. **ALDRIDGE**. The next chart addresses the issue of the cost to the Nation of the CELV program. We have heard the funds being $2.1 billion. That is in then-year dollars. If the contract is put in constant fiscal year 1985 dollar terms, it is $1.6 billion. That is what is shown in the CELV price.

But that price includes 10 Centaurs which will fly whether or not they were on ELV or the shuttle. So, you can't put that as a cost. Those are identified with specific satellites.

Of course, we would have to reimburse NASA for the 10 shuttle flights if we launched without the CELV. Right now Mr. Beggs notes that the cost to the Government to fly the orbiter is about $87 million. That is a new number. We had an earlier number of $84 million which is shown on the left part of the chart.

We have to reimburse NASA for that. So that results in 10 shuttle flights for $962 million which says the cost to the Nation is $255 million under those assumptions.

As you know, there is quite a debate brewing within the administration on what the cost of the orbiter flight actually is. We have used a couple of numbers from the Congressional Budget Office study on this particular subject using other numbers of $106 or $150 million, depending on how that debate comes out.

It says that the cost to the Nation actually will be a savings, depending on the reimbursement rate of the cost of the shuttle.

Senator **Stevens**. I tell you I don't understand that chart. Maybe you can explain it to us.

Mr. **Aldridge**. Yes, sir. The assumption is that the CELV will fly 10 payloads. If we did not have a CELV, then we would have to fly those 10 payloads on the shuttle.

Basically what it means is that depending on what your assumption is on the cost of the shuttle flight, you can either say the cost to the Nation is some cost of $255 million or actually you would be saving money if you fly on the ELV.

It is either one or the other. It is an ELV with 10 flights or a shuttle with 10 flights and depending on the assumptions you make on the shuttle pricing policy, you can either show a savings or a cost to the Nation.

The cost to the Nation is what I am trying to demonstrate. It's not the $1.6 billion that is being quoted as an insurance policy. That is not the issue. It is not $1.6 billion. It is actually much less than that depending on the price and assumptions.

SAVINGS

Senator **Stevens**. How do you figure it is a savings by sending up more flights?

Mr. **Aldridge**. The savings are identified as what it cost us in DOD to fly the orbiter. The assumption is from the CBO study, there are various rates of flight charges we have to pay to fly the orbiter.

Senator **Stevens**. What about the taxpayer? How much will it cost to have you fly them and have NASA flying them, too?

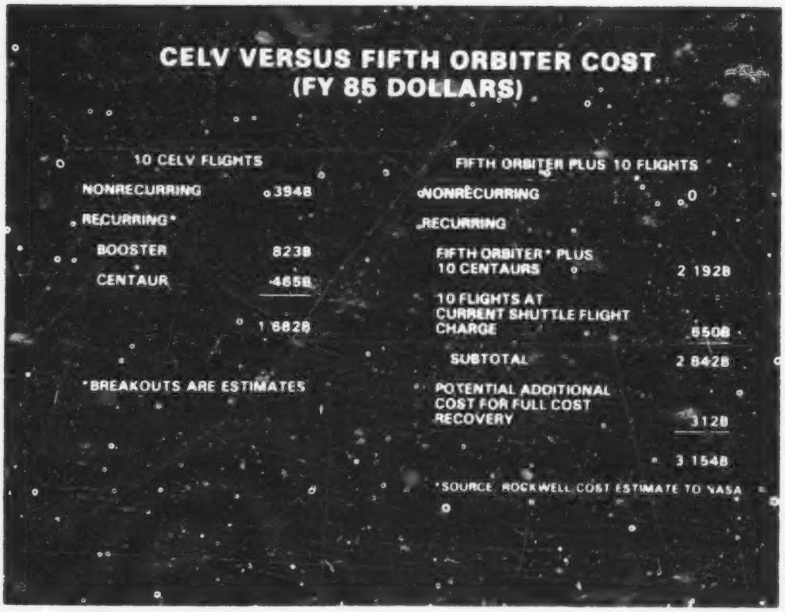
Mr. **Aldridge**. It would be one or the other. NASA would fly them on the shuttle or we would fly them on the CELV, not both.

Senator **Stevens**. You are saying it is costing less to have two separate systems flying and it is good to have one and you using the NASA system?

Mr. **Aldridge**. Depending on the pricing policy, that could be the case. Remember, NASA will continue to fly 24 flights a year. These CELV's are only two flights a year in addition to that.

So, we are basically having a flight rate of 24 per year. This is with two flights per year for the 10 ELV's.

Senator **Stevens**. I am sorry to interrupt. We will have more questions later.



CELV VERSUS FIFTH ORBITER COST
(FY 85 DOLLARS)

10 CELV FLIGHTS	
NONRECURRING	.394B
RECURRING*	
BOOSTER	.823B
CENTAUR	.465B
	1.682B

*BREAKOUTS ARE ESTIMATES

FIFTH ORBITER PLUS 10 FLIGHTS	
NONRECURRING	0
RECURRING	
FIFTH ORBITER* PLUS 10 CENTAURS	2.192B
10 FLIGHTS AT CURRENT SHUTTLE FLIGHT CHARGE	.650B
SUBTOTAL	2.842B
POTENTIAL ADDITIONAL COST FOR FULL COST RECOVERY	.312B
	3.154B

*SOURCE: ROCKWELL COST ESTIMATE TO NASA

Slide 2

COST

Mr. ALDRIDGE. The next issue was the cost: why not buy the fifth orbiter?

When you buy the fifth orbiter, it takes funds to fly it. The key is to look at the ELV Program again: 10 CELV flights. These are 10 launches at $1.6 billion. Rather than buying the CELV, why not take that money and buy an orbiter?

The fact is that the fifth orbiter plus the 10 Centaurs that would have to fly, because that is what we fly on the ELV, is $2.2 billion. You haven't launched it yet. So you have an orbiter without a flight.

At the current shuttle pricing policy, which is $65 million per launch, 10 flights cost $650 million, with a subtotal of $2.84 billion and then, of course, if you have to charge additional cost of the full cost recovery, it could be between $2.8 and $3 billion for the fifth orbiter plus the 10 flights versus $1.6 billion for the CELV.

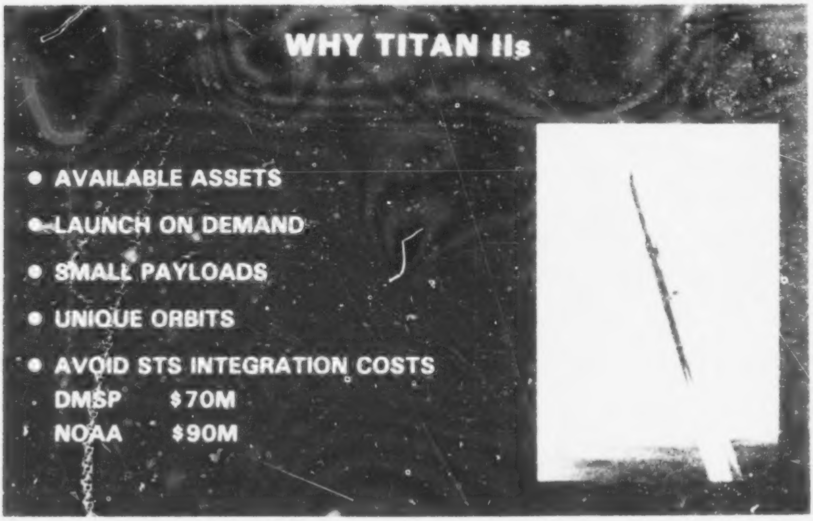
SLIDE 15

CELV FACILITIES

Mr. ALDRIDGE. The next chart shows the facilities that we use for the CELV at Kennedy Space Center. We would only fly the CELV out of Kennedy, a complex which currently exists.

The one at the far left corner of the chart is launch complex 41. That would be modified to launch the CELV. We currently use the launch complex 40 which is shown on the right side of the chart.

As you may recall from being there, further to the left is the launch complex 39 which is the shuttle launch site. Basically we would maintain the Titan facility. It would maintain about 700 jobs for the State of Florida and there would be about a $40 million modification cost to launch complex 41 to make it capable to launch the ELV.



WHY TITAN IIs

- AVAILABLE ASSETS
- LAUNCH ON DEMAND
- SMALL PAYLOADS
- UNIQUE ORBITS
- AVOID STS INTEGRATION COSTS
  - DMSP $70M
  - NOAA $90M

SLIDE 16

TITAN II ISSUE

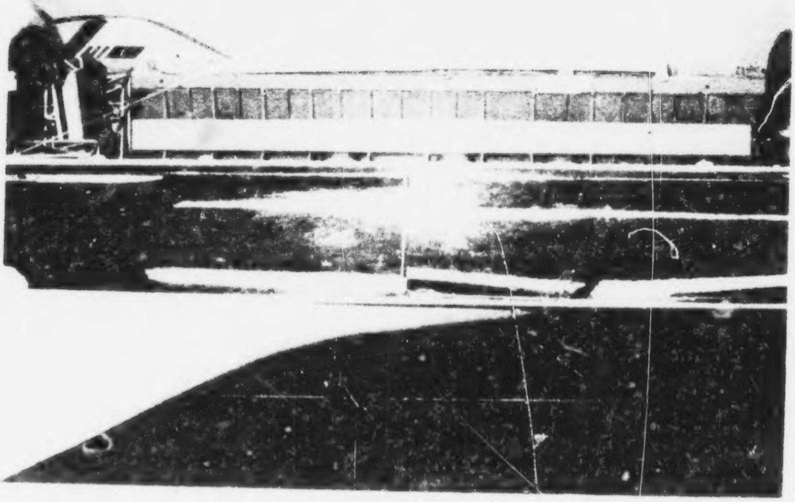
Mr. ALDRIDGE. Mr. Chairman, I would like to turn to the Titan II issue. As you know, this is part of the President's decision on strategic modernization to deactivate the 54 Titans that were in operational silos. We will have a total of actually 56 Titans available. They are free assets.

We looked at several studies to decide what we could launch with those particular assets just like we launch Thor and Atlas missiles today and, in fact, we found some small payloads that could be launched on Titan IIs and use those existing assets from Vandenberg.

Again, they are available. We have small satellites that we could launch on demand into unique orbits that may or may not be compatible with the shuttle orbit parameters and we can avoid some integration cost of putting some satellites on the orbiter itself.

For example, for the Defense Metereological Satellite Program [DMSP], it costs about $70 million to mod that vehicle for shuttle launches. If no modification were required we could save those funds.

NOAA has asked us to look at flying their weather satellite on the Titan II. Their estimate to us was about $90 million for integrating on the shuttle, although I have no basis for determining whether that number is correct. Those satellites are also potentially available for Titan II.



SLIDE 17

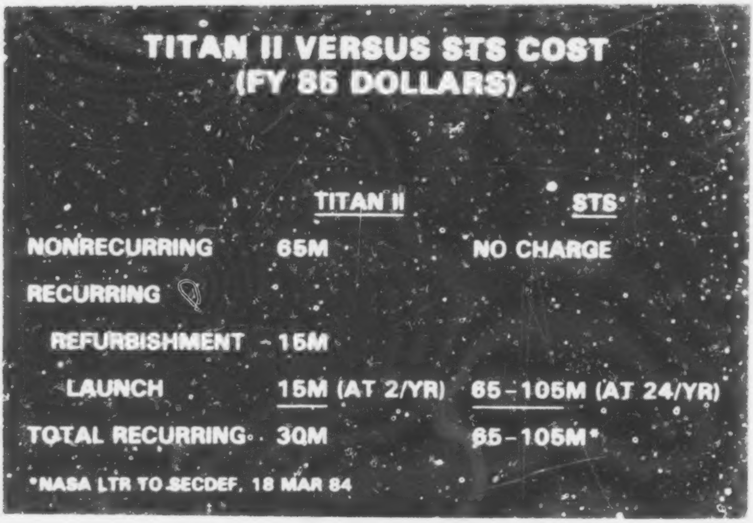
DMSP PAYLOAD

Mr. ALDRIDGE. The next chart shows the model of the shuttle bay, showing the DMSP satellite in the shuttle bay. It only takes 10 percent of the payload and a small percentage of the bay volume. That satellite has to go into a unique polar orbit and it has to be launched at a precise time.

If for some reason, we could not find or share a ride with the shuttle, we would have to pay the entire shuttle bay cost to make that flight. We believe Titan II would be a perfect utilization for that small payload so the orbiter can do the thing which it is uniquely designed to do.

Senator STEVENS. That would be an unmanned flight?

Mr. ALDRIDGE. Yes, sir, if it were put on Titan II, it would be an unmanned flight.



TITAN II VERSUS STS COST
(FY 85 DOLLARS)

	TITAN II	STS
NONRECURRING	65M	NO CHARGE
RECURRING		
REFURBISHMENT	~15M	
LAUNCH	15M (AT 2/YR)	65–105M (AT 24/YR)
TOTAL RECURRING	30M	65–105M*

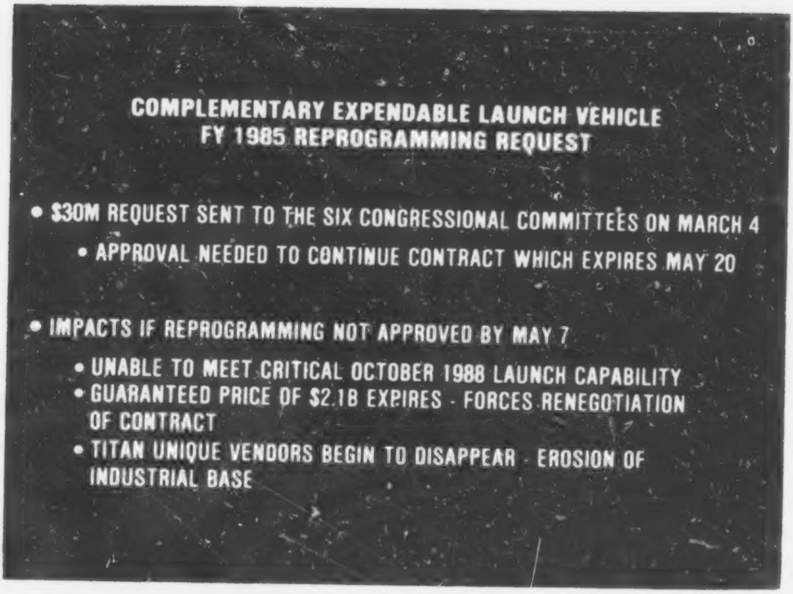
*NASA LTR TO SECDEF, 18 MAR 84

Slide [illegible]

TITAN II REFURBISHMENT COST

Mr. Aldridge. The next chart shows the dollar cost of this [illegible]. Our estimates are $65 million of nonrecurring cost [illegible] the development [illegible] and the interface structure for the Titan II and then [illegible] $15 million for each missile to refurbish the missile to make it [illegible] and that includes procurement of the shroud and $15 million of launch operations at Vandenberg.

That is about $30 million each year and we average about two flights per year. So it would average $[illegible] million per launch or $30 million per launch on a recurring basis. Depending on what the price of the orbiter would be if we had to pay for that, it would cost us $65 to $105 million a year to launch the orbiter with the DMSP payload.



COMPLEMENTARY EXPENDABLE LAUNCH VEHICLE
FY 1985 REPROGRAMMING REQUEST

- $30M REQUEST SENT TO THE SIX CONGRESSIONAL COMMITTEES ON MARCH 4
  - APPROVAL NEEDED TO CONTINUE CONTRACT WHICH EXPIRES MAY 20
- IMPACTS IF REPROGRAMMING NOT APPROVED BY MAY 7
  - UNABLE TO MEET CRITICAL OCTOBER 1988 LAUNCH CAPABILITY
  - GUARANTEED PRICE OF $2.1B EXPIRES - FORCES RENEGOTIATION OF CONTRACT
  - TITAN UNIQUE VENDORS BEGIN TO DISAPPEAR - EROSION OF INDUSTRIAL BASE

SLIDE [illegible]

REPROGRAMMING REQUEST

Mr. ALDRIDGE. Mr. Chairman, you have mentioned that we have sent a $30 million request for this program to add to the $5 million that was already appropriated last year to get this program on track. We sent it over on March 4.

We have a fixed-price contract bid from Martin Marietta to proceed with the CELV. That contract expires May 20. We need that reprogramming approved. We sit here May 7, which is today, and indeed we would like to have it today, but it will be a few days or so before we are forced to renegotiate that particular program.

We certainly request the committee to give favorable consideration to that reprogramming action as well as the entire program.

Mr. Chairman, that completes my part of the presentation. We can open up for questions at your pleasure or we can proceed with General Kutyna for a short presentation.

The statement of Mr. Aldridge follows:

PREPARED STATEMENT OF HON. EDWARD C. ALDRIDGE, JR.

UNDER SECRETARY OF THE AIR FORCE

Mr. Chairman and Members of the Committee:

It is a pleasure to discuss with you the launch strategy of the Department of Defense. In order to gain the DoD perspective on the subject, I will describe: the rationale for the Complementary Expendable Launch Vehicles (CELV); our plans for the converted Titan II Intercontinental Ballistic Missiles (ICBMs); our commitment to the Space Shuttle; and finally, I would like to share some thoughts concerning the emphasis of the Nation's future space launch strategy.

The CELV chosen through a competitive process is the Titan 34D7, and is a result of Defense needs for assured access to space. The requirement for assured access to space derives from the increasing importance of space assets to National Security. The Defense requirement for more assured access to space under conditions of peace, crisis, and conflict has been stated unambiguously in several Administration policy documents, and is fully consistent with the President's July 1982 National Space Policy. The requirement for a Complementary ELV has been well defined in many space architecture and launch vehicle studies. The President's National Space Strategy specifies that DoD must "...pursue an improved assured launch capability to satisfy two specific requirements -- the need for a launch system complementary to the STS to hedge against unforeseen technical and operational problems, and the need for a launch system suited for operations in crisis situations." The CELV requirement was expressed by the Secretary of Defense in a 7 February 1984 memo, "Defense Launch Strategy." NASA and DoD agreed to the need for an ELV complement to the STS, and the President formalized the Administration's position in his National Security Launch Strategy, dated 25 February 1985.

A Congressionally requested report prepared by the National Research Council (NRC) endorsed the need for a Complementary ELV capability. This report warned that generic failures of the STS could shut down the Nation's launch capability. At the same time, a companion study by the NASA Advisory Task Force expressed concern that "the early elimination of ELVs would leave the U.S. with neither a backup to the shuttle nor active production lines for space launch vehicles of any kind." Assured access to space has, in summary, been endorsed by the President, the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, the Joint NASA/DoD Launch Vehicle Technology Study Group, and the NRC.

To fulfill the Nation's need for a complement to the STS, the Air Force conducted a competition for the design, development and production of a CELV which would be a derivative of today's operational launch systems. The objective of the competition was to provide a timely, low risk, and cost effective approach which would meet our requirements. Should unforeseen evolutionary weight increases emerge, each of the candidate CELVs would have growth capability to meet any reasonable need up to the year 2000.

Two industry competitors responded to the Air Force Request for Proposal: Martin Marietta entered with an upgraded version of their very successful Titan series, the Titan 34D7; General Dynamics responded with an improved variant of their proven Atlas space launch vehicle, the Atlas II. NASA entered a Space Shuttle derivative vehicle, the SRB-X.

As a result of the standard competive process, the winner was the Martin Marietta Titan 34D7. It was lighter than the SRB-X by a factor of two, cheaper by 20%, and has less technical risk, giving us confidence of meeting the launch date. Martin Marietta offered a fixed price contract for the Titan 34D7 development,

To satisfy the DoD requirements for a complementary procurement and launch between 1988 and 1993. These ELVs will complement the Shuttle by having the ability to launch Shuttle-size payloads weighing up to 10,000 pounds into geosynchronous orbit. Although this capability is necessary as soon as possible, the most cost effective and efficient procurement plan will lead to an initial launch capability in October 1988, shortly after the last of the Nation's current generation of the largest ELVs (Titan 34D) has been used. The current direction to meet an October 1988 date is driven by the launch needs of a critical National Security payload. Design considerations of that satellite drive the urgent need to begin procurement of the CELV. To be capable of launch on the Shuttle or a CELV, we must incorporate those design parameters into the design of the satellite now.

The CELV program candidate payloads weigh less than the 10,000 pound booster capability during the FY 89-93 timeframe. Even with survivability enhancements, candidate Titan 34D7 payloads should not exceed 10,000 pounds.

While supporting the need for a complementary capability, last year's Appropriations Conference Committee requested an analysis of the implications of their various CELV alternatives in meeting both short-term and long-term ELV requirements. The following summarizes that analysis:

COMPLEMENTARY CAPABILITY: Before we discuss the relative cost, schedule, performance and growth capabilities of the CELV candidates, we need to evaluate the CELV alternatives on the merits of fulfilling the fundamental need for which they are being developed and procured -- to provide a complement to the STS for National Security payloads. Evaluating the consequences of the loss of an Orbiter, or a grounding of the Orbiter fleet is part of the planning job the military must do for our National Security. No set of machinery is infallible. If the Orbiter fleet were to be grounded for just six months in the early 1990's, it would take the Nation two years at a nearly impossible surge rate of thirty flights per year to catch up. Moreover, if an Orbiter were lost, we could never catch up using the remaining capability. The selection of the Titan 34D7 gives us a launch vehicle which is separate and distinct from the Shuttle system in almost every aspect. Hardware, launch facilities, control centers, the industrial base, and even the launch crews are independent of the STS. Any Space Shuttle system problem would have no effect on the launch of such a CELV, and likewise, any problem with the CELV would have no effect on the Shuttle.

Faced with imminent termination of the Nation's expendable launch vehicle programs, we are currently in a position where a single point failure in the industrial or operational base supporting the Shuttle could preclude our ability to get any systems (commercial, Government, or National Security) into space for an indeterminate period.

GROWTH: While the DoD competition for a CELV did not specify growth, the Congress was concerned that this aspect of the CELV capability be considered. Therefore, we again reviewed all potential payloads to insure that the CELV would adequately meet any planned or reasonable payload growth. All studies conducted to date including NASA, DoD and the Strategic Defense Initiative Office, have identified no requirements through at least the year 2000 that exceed the capability existing in the STS and the CELV. All the CELV candidates demonstrated sufficient growth capability to satisfy any unforeseen payload needs that might occur between now and the end of the century.

The Titan 34D7 has several distinct growth increments. These increments provide a range extending from a 10% growth margin over the Shuttle capability and foreseeable payload weight to about four times that maximum. Clearly, if payloads were to exceed the capability of the Shuttle, we could launch them on expanded versions of the CELV, but we would lose an essential ingredient in the concept of assured access to space -- we would again have no alternative launch system for some of our most important National Security payloads.

The potential needs of the Strategic Defense Initiative, the Space Station, and any new DoD systems must mature enough to be carefully defined before we commit our scarce resources to a major development program to build a booster which might or might not be needed. If a heavy lifter is ever needed by the Nation, and that need is not a certainty in light of our potential ability to use on-orbit assembly techniques for large structures, the Nation can develop a vehicle derived directly from the STS or use the best alternative technology available. The Space Shuttle and the CELV will clearly meet the Nations's needs during the next 15 years, while longer term requirements are being defined.

INDUSTRIAL BASE CONSIDERATIONS: The defense industrial base is the cornerstone of readiness and modernization of our space capabilities, and provides the means for meeting our commitments in times of crisis and conflict. To sustain our leadership position, the strength of our manufacturing and technology must be maintained. This need was recognized by both DoD and NASA in our joint LAUNCH VEHICLE STUDY response to the President's National Space Strategy. However, until the CELV initiative, the National production of launch vehicles was being phased out.

After 1985 there would have been no further U.S. production of NASA or DoD launch vehicles. This implies the disappearance of U.S. engineering and production know-how and capability. In contrast, the Soviet Union, China, France and Japan continue to build and exploit expendable launch vehicles.

Once our production lines are closed, a restart will be far more costly and production time considerably longer. The normal lead time for the manufacture of an expendable booster is approximately 42 months with an ongoing production base. If one has to start a launch vehicle program from "scratch," the lead time could be 7 to 10 years. Our mutual concern, then, is one of keeping America in the space launch business

Commercialization: The President's National Space Strategy encourages commercial ELV activities, and sets the policy to promote competitive commercial ELV operations and encourage private sector developments.

As of December 1984 the French Ariane space launch vehicle had captured more than twenty payloads to be launched between now and the end of 1987. Domestic ELVs represent the same technology as used by Ariane, but have demonstrated enviably higher reliability which should be exploited. Ariane's success points to the fact that there is a market for vehicles that lack the Shuttle's unique capabilities, but provide schedule flexibility and launch date assurance not always present in the STS because of high priority DoD and other Government users. NASA is an example of the latter, with their tightly constrained planetary launch windows in May 1986. The CELVs, though not originally proposed as commercial boosters, could provide a continuing ELV production line to allow direct competition with Ariane.

A large hurdle for commercial ELVs has been price. When U.S. contractors recently bid on launch contracts, they lost to the Ariane on price. If production lines are kept open to provide a base to hold down costs, our industry could compete with Ariane. Since the commercial payloads have no need for heavy lift capabilities without some multiple payload manifesting, the CELV ability to downscale would be commercially important.

While the above by no means implies that the DoD should susidize commercialization, it does say that the fallout of satisfying the DoD requirement could provide other benefits for the Nation as a whole.

SUITABILITY FOR CRISIS AND CONFLICT OPERATIONS: The President's National Space Policy directed that military space systems must be survivable. The Titan 34D7 provides a balance to the STS capabilities, and an additional degree of freedom for operation in crisis and conflict unattainable with a manned system.

COSTS: The present price of the CELV contract is $1.68 billion (FY 85$). This includes the initial design and engineering, purchase of ten Centaur upper stages, ten boosters, launch facility modifications, and the launch costs for all ten flights. Since the ten Centaurs would be used on either the Shuttle or the Titans, the actual cost to design, build and launch the ten Titans is less than $1.2 billion. Another way to look at the costs is that the total additional cost to the taxpayer for the CELV program is between $250 Million and $750 Million, depending on the various STS cost assumptions used. We thus achieve high confidence of placing 10 high priority National Security satellites into orbit for the additional equivalent cost of one or two satellites. If, however, the STS fails to meet its target of 24 launches in a year, for whatever reason, the 10 flights made available by the CELV procurement could be sold to other users. The funds received from these 10 flights could more than offset the cost of the CELV.

An alternative to buying CELVs might be acquiring a fifth Orbiter. But the purchase of a fifth Orbiter does not provide assured access to space. Also, the mission model does not support such a step. Further, to compare costs directly, it costs $1.6 Billion to build the CELV and fly it ten times. The cost of buyng the fifth Orbiter and flying it 10 times is more than $3 Billion.

The report on the analysis of the ELV alternatives was forwarded to Congress by the Secretary of Defense on February 23, 1985. Subsequently, we obligated the $5 Million Congress appropriated last year to place Martin Marietta on contract to begin work, and we have submitted a reprogramming action for the additional $30 Million needed in 1985 to hold our launch schedule for FY 89. We have requested the appropriate funds in the FY 86 and Five Year Defense Plans to continue development and procurement.

This has been an emotional and controversial issue over the past year or so, and it is an often misunderstood issue. The misunderstanding has been related to a misconception that the CELV was only a "ploy" by the DoD to abandon the Shuttle. Nothing could be further from the truth. Over the past several months, Jim Beggs and I have worked to alleviate the concerns of both NASA and DoD with regard to the CELV, Shuttle and future launch vehicles and came to an agreement formalized by the President in his National Security Strategy on 25 February 1985. Let me summarize that agreement.

- First, we will work together to ensure the Shuttle is a viable operational system heading toward 24 flights in a year;
- Second, NASA agrees with the need for a CELV, with the Air Force buying 10 vehicles to be launched at 2 per year between 1988-1993.
- Third, DoD will commit to at least 1/3 of the available STS flights over the next 10 years. Let me add, that is independent of and in addition to the number of ELVs to be flown during that period.
- Fourth, we will develop a pricing policy for STS flights that will give positive incentive for DoD flights on the STS.
- Fifth, we will work together on studies of second generation space transportation systems using manned and unmanned systems for all users needs.
- And finally, any disagreements regarding implementation of this agreement are to be referred to the Assistant to the President for National Security Affairs and subsequently, if necessary, to the President.

The Air Force is taking another step in space launch. When the President announced his decision to deactivate the Titan II ICBMs as part of the Strategic Modernization Program in 1981, we initiated a study to determine if there was a cost effective use for these residual National launch assets. We found the Titan II had sufficient performance to meet the launch needs of some Defense programs which require small, launch-on-demand satellites to be placed in unique low altitude, high inclination orbits, such as the Defense Meteorological Satellite. These payloads clearly do not effectively or efficiently use the Shuttle's capabilities, and do not lend themselves to routine mixing with other missions. The use of the Titan II instead of a Shuttle for such programs makes economic and programmatic sense. For instance, the defense meteorological Satellite would require a dedicated Shuttle launch using less than 10% of the Shuttle's polar orbit capability. This would be an extremely inefficient and ineffective use of the Shuttle manned launch system. Rather than pay to scrap them, and based on our successful experience with the Atlas ICBM and Thor IRBM conversion to launch vehicles, we are going to refurbish 13 of the Titan IIs which we are currently deactivating. We plan to convert them for low altitude, high inclination missions from the West Coast between 1988 and 1995. This will responsibly use the prior National investment in these missiles. The costs to accomplish this are $65 Million for the initial engineering and launch pad conversion, and approximately $15 Million per vehicle refurbishment. The total cost to the taxpayer for a Titan II space booster launch will be about $30 Million. Our initiative to use these valuable National resources is reflected in the FY 86 President's Budget.

In summary, as a Nation, we should have the most versatile and capable launch systems. I believe we have that opportunity facing us today. We must create an environment where the launch capabilities for all space sectors -- civil, commercial, and National Security -- are complementary, not competitive. We must foster all three capabilities and use each in its most advantageous application if we are to maintain our National space transportation leadership.

This concludes my remarks, Mr. Chairman. I would be happy to answer any questions you may have.

STATEMENT OF BRIG. GEN. DONALD J. KUTYNA

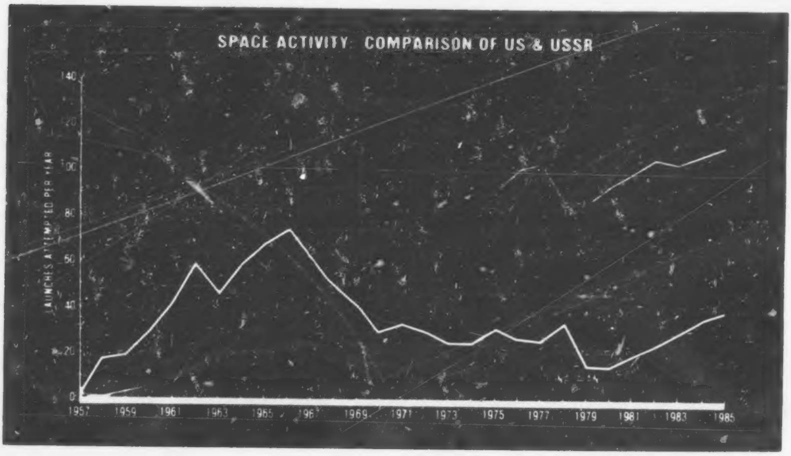
U.S. AIR FORCE IN SPACE

Senator **STEVENS**. General, will you proceed.

General **KUTYNA**. Yes, sir. Will I be allowed to stand at the screen, sir?

Senator **STEVENS**. You may do whatever you wish.

General **KUTYNA**. I would like to give a brief overview of the Air Force in space as a basis for your questions to follow. I would like to talk about space, not in a vacuum, but as it interfaces with other systems to support certain mission areas we have in the Air Force.



SLIDE 20

SPACE ACTIVITY

I would first like to show this chart of space activity which indicates the number of Soviet launches versus the number of U.S. launches over the years.

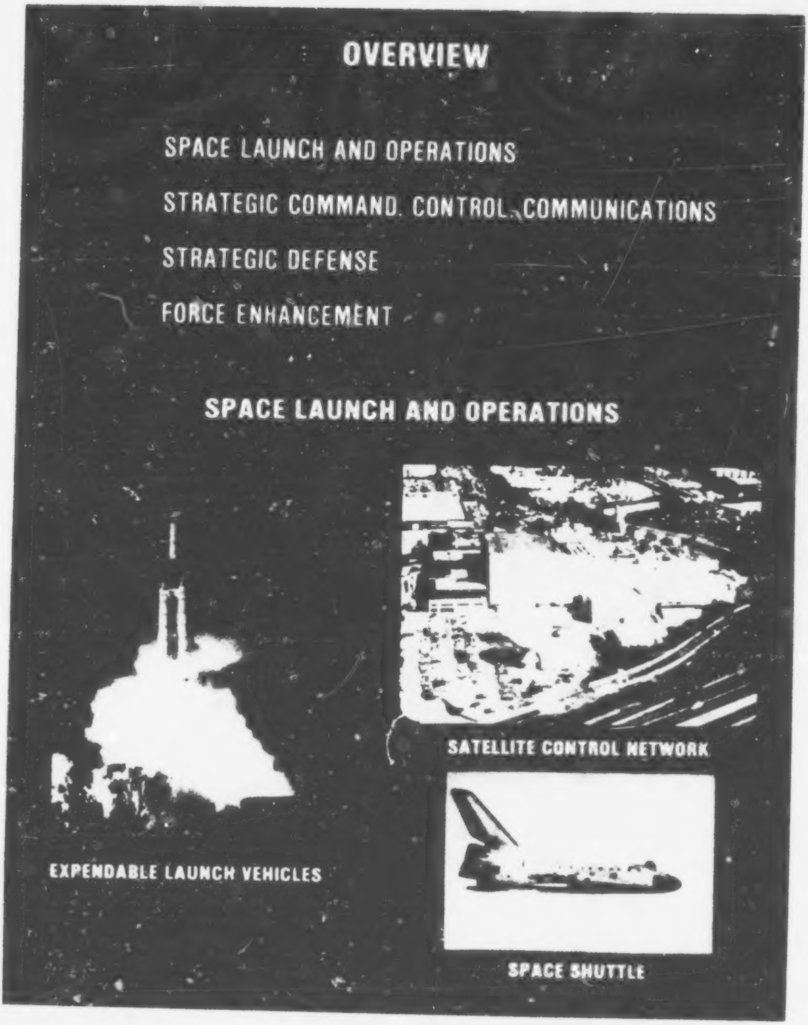
As you can see, this chart has some good news and bad news. The bad news is that the Soviets are building their force structure in space.

As a matter of fact, their growth in the space budget is about 15 percent higher than the average growth of all the other military force structure.

The good news is the United States while launching a third to a quarter as many space vehicles, thanks to our science and technology, does a much better job than the Soviet space force structure does.

I would like to break the briefing down into these areas.

I would like to tell you how we get into space, how we operate there, and address two very important mission areas, strategic C^3, strategic defense, and how space systems help enhance our forces. I would first like to talk about space launch and operations.



OVERVIEW

SPACE LAUNCH AND OPERATIONS

STRATEGIC COMMAND. CONTROL COMMUNICATIONS

STRATEGIC DEFENSE

FORCE ENHANCEMENT

SPACE LAUNCH AND OPERATIONS

EXPENDABLE LAUNCH VEHICLES

SATELLITE CONTROL NETWORK

SPACE SHUTTLE

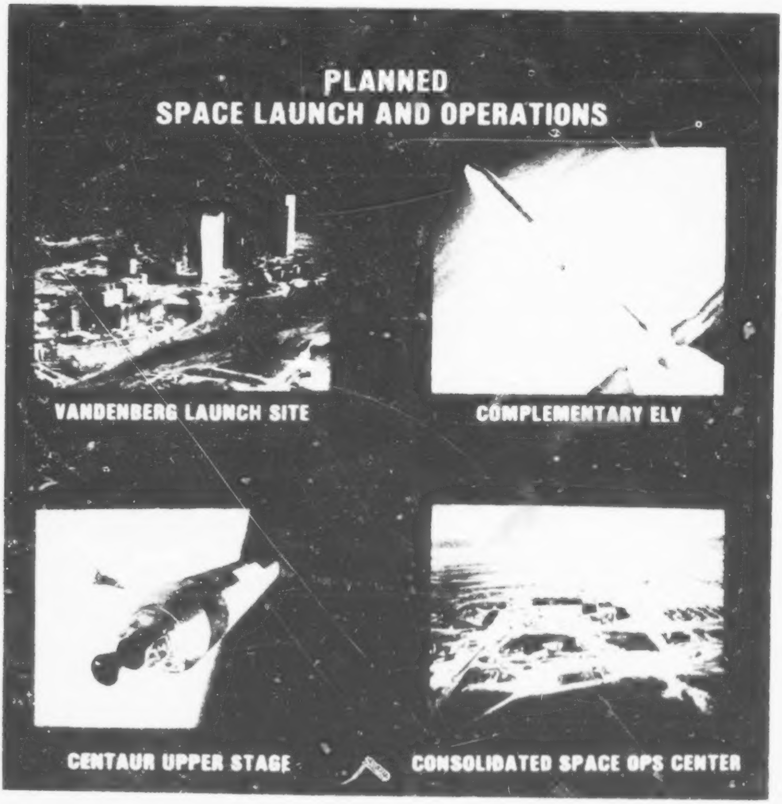
Slide 21

SPACE LAUNCH AND OPERATIONS

Expendable launch vehicles have been our primary access to space for about the last 20 years. We are moving rapidly into the space shuttle. By 1988 we will be flying about 70 to 80 percent of our missions on the space shuttle and using a third of the NASA capability to provide shuttle flights.

We had our first mission this January and it was very successful. To control these satellites, we have the Satellite Control Network headquartered at Sunnyvale, CA, and seven remote tracking stations around the world. We keep track of the health and status of the various satellite programs with these stations.

In the future we are looking at upper stages to complement those we already have.



PLANNED
SPACE LAUNCH AND OPERATIONS

VANDENBERG LAUNCH SITE

COMPLEMENTARY ELV

CENTAUR UPPER STAGE

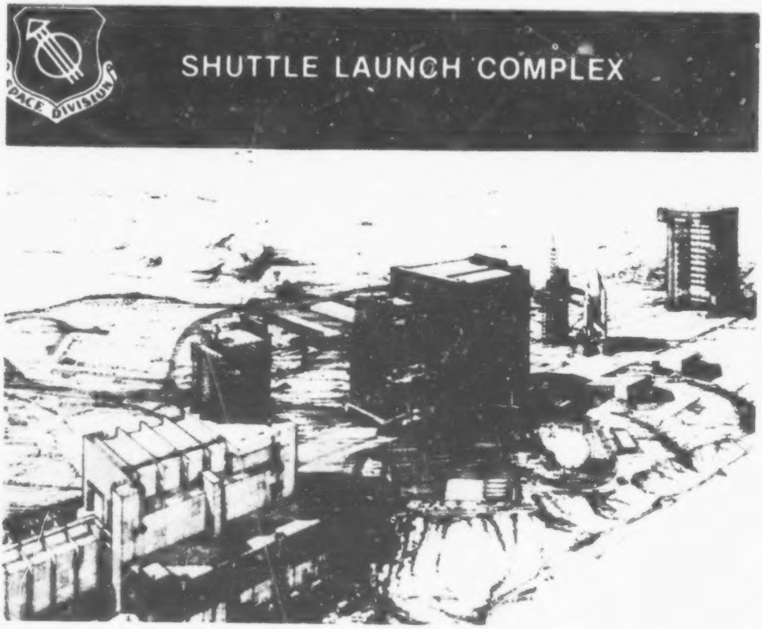
CONSOLIDATED SPACE OPS CENTER

SLIDE 22

PLANNED LAUNCH AND OPERATIONS

We have the Inertial Upper Stage (IUS) and we are now developing jointly with NASA the Centaur upper stage which will give us a much greater capability of carrying 10,000 pounds to geosynchronous orbit either on the shuttle or the complementary launch vehicle.

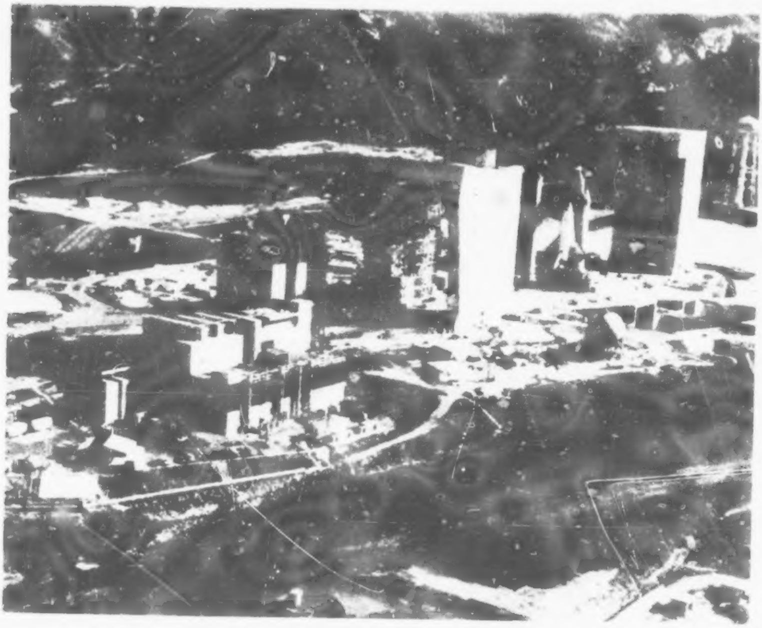
To provide a second node for a Satellite Control Facility, we are going to what is called the Consolidated Space Operations Center in Colorado Springs. It will do two things. First, it will complement our satellite control capability at Sunnyvale, CA, and second it will provide a second node and more capacity for NASA's Johnson Space Center control facility for the space shuttle. This facility is well on its way. We will have a beneficial occupancy date of fall of this year and full operational capability about 1992.


SHUTTLE LAUNCH COMPLEX

SLIDE 23

VANDENBERG LAUNCH SITE

We have mentioned the Complementary Expendable Launch Vehicle. I would like to talk a little bit about our Vandenberg launch site from the west coast. This site has come a long way as the following slides (24 through 27) descriptively show. When I got into the program we had little more than this artist's sketch. We spent $2.8 billion on that site.



Slide 24

Slide 25

Slide 26

Slide 27

BEST CO

As you can see, artist's sketch has turned into reality. This picture was taken just a few months ago at Vandenberg. We have ferried the space shuttle orbiter *Enterprise* to Vandenberg. We trucked it down the highway 17 miles from the landing strip and put it up on the launch pad to test out the various components to make sure that the site works. That site will be ready this October and we will have our first launch in about March 1986.

STRATEGIC COMMAND.
CONTROL. COMMUNICATIONS
HQ SAC

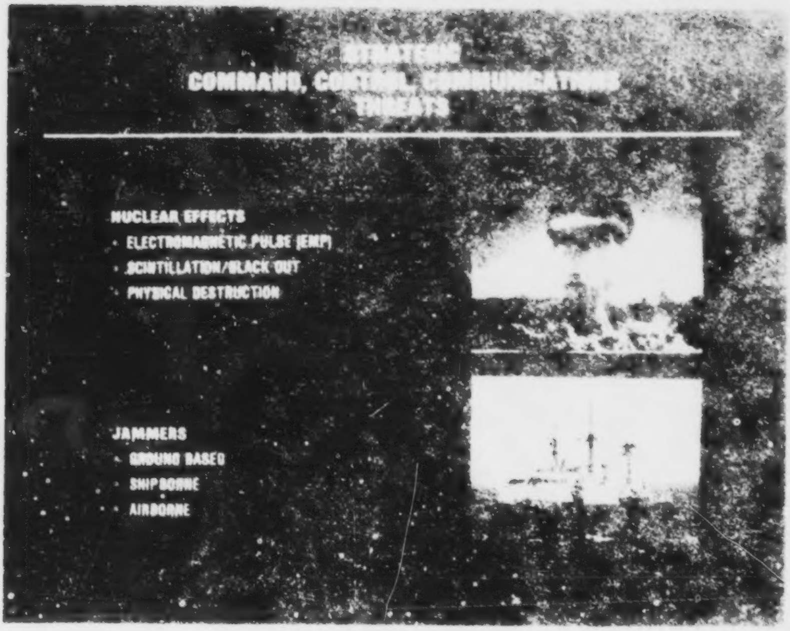
SLIDE 28

STRATEGIC C^3

One of our most important missions in space is strategic command, control and communications. C^3 is the ability of our National Command Authority to find out what is happening in a wartime situation from the various sensors we have around the world, such as the Ballistic Missile Early Warning sites in Greenland, in Alaska and in England; our submarine-launched ballistic missile warning sites we have in New England and California, called PAVE PAWS, and various other sensors that take data through our satellite systems and other systems into the National Command Authority, the President as National Commander; and then through various means out to the major commanders, would they have to execute the forces—bombers, ICBM's or submarine launched missiles.

Our satellite systems play a key role. The Air Force Satellite Communications System flies on a military satellite and also is host on some of our civilian satellites.

We have the DSCS II satellite system which provides wide band data, lots of data, to our forces. We have airborne command posts such as the E-4 and EC-135, and we have ground-based systems that help in this capacity.



STRATEGIC COMMAND, CONTROL, COMMUNICATIONS THREATS

NUCLEAR EFFECTS
- ELECTROMAGNETIC PULSE (EMP)
- SCINTILLATION/BLACK OUT
- PHYSICAL DESTRUCTION

JAMMERS
- GROUND BASED
- SHIPBORNE
- AIRBORNE

Slide 29

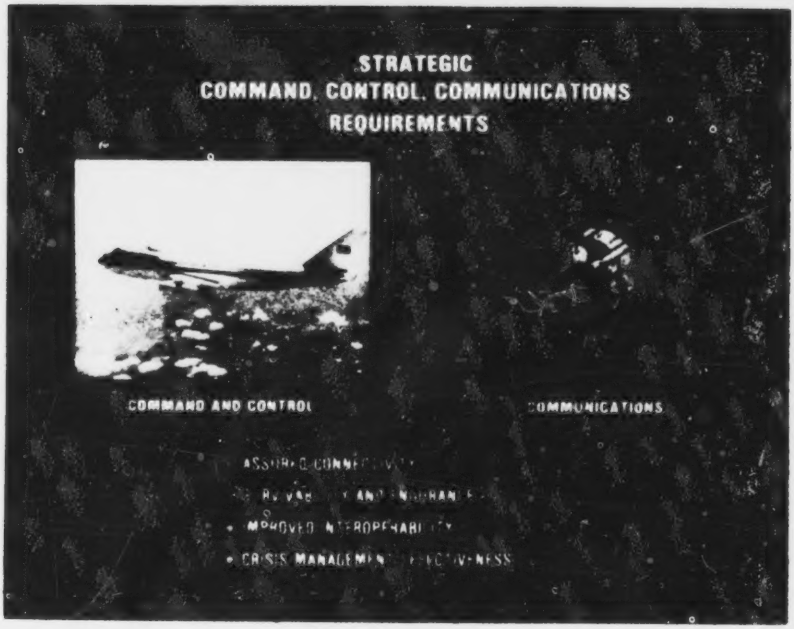
However, there is a threat out there that these systems were not designed for. For example, nuclear effects. You could have electromagnetic pulses wiping out these systems, scintillation/blackout, or physical destruction.

PRESENT STRATEGIC COMMAND, CONTROL, COMMUNICATIONS AFTER NUCLEAR EFFECTS AND JAMMING

SLIDE 30

JAMMING TECHNIQUES

Simple jamming—ground, ship, or airborne could render many of these systems useless. With the current systems, the enemy could wipe out most of the ground-based assets and leave us only with the airborne links to execute these forces.



STRATEGIC
COMMAND, CONTROL, COMMUNICATIONS
REQUIREMENTS

COMMAND AND CONTROL

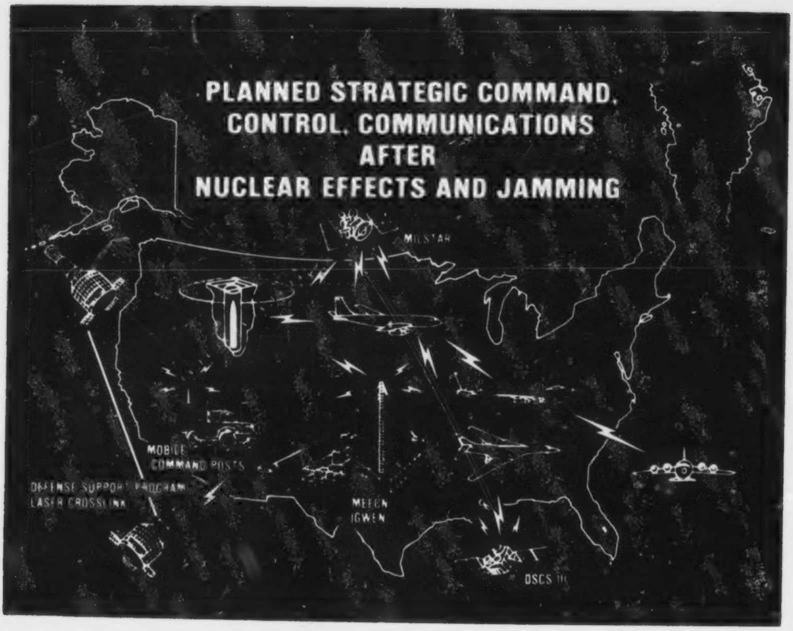
COMMUNICATIONS

- ASSURED CONNECTIVITY
- SURVIVABILITY AND ENDURANCE
- IMPROVED INTEROPERABILITY
- CRISIS MANAGEMENT EFFECTIVENESS

SLIDE 31

ASSURED CONNECTIVITY

That is an unacceptable situation. We need assured connectivity between the forces. To make those forces survive and make them endure through any level of conflict, we have to improve interoperability with other systems and, therefore, get better management effectiveness out of our system. Satellites play a key role in this.



PLANNED STRATEGIC COMMAND, CONTROL, COMMUNICATIONS AFTER NUCLEAR EFFECTS AND JAMMING

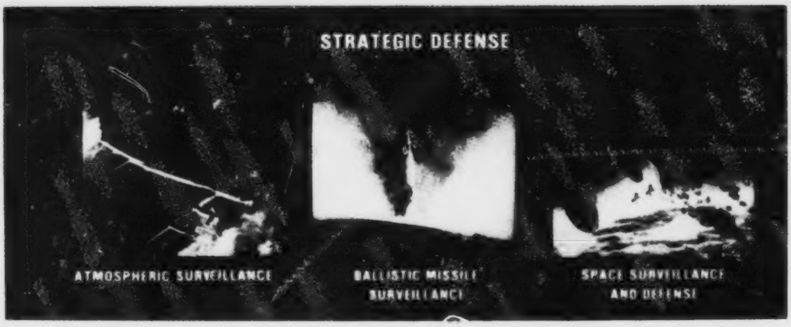
SLIDE 32

MILSTAR SATELLITES

The new Milstar satellites will be the cornerstone for passing the command messages to our forces. That satellite is jam resistant, it will survive in a nuclear environment and [deleted].

The DSCS III satellite will have much better jamming resistance and be more survivable in a nuclear environment than DSCS II. To complement that, we have a Minimum Essential Emergency Communications system on the ground. A component of that is the Ground Wave Emergency Network, a great number of ground stations that can withstand electromagnetic pulse and are proliferated to the point that a nuclear attack would not easily wipe them out.

Finally, we need mobile command posts for command authorities to receive messages and continue to command these forces in the event of a conflict.



STRATEGIC DEFENSE

ATMOSPHERIC SURVEILLANCE

BALLISTIC MISSILE SURVEILLANCE

SPACE SURVEILLANCE AND DEFENSE

Slide 33

STRATEGIC DEFENSE

Next, let me talk about strategic defense. Strategic defense consists of three areas: atmospheric surveillance and warning, ballistic missile surveillance, and space surveillance and defense.

We have not talked too much about atmospheric warning because missiles have been our primary threat and bombers were secondary.

SLIDE 34

SLIDE 35

SOVIET BOMBER AND MISSILE FORCES

With the advent of an increase in Soviet bomber forces——

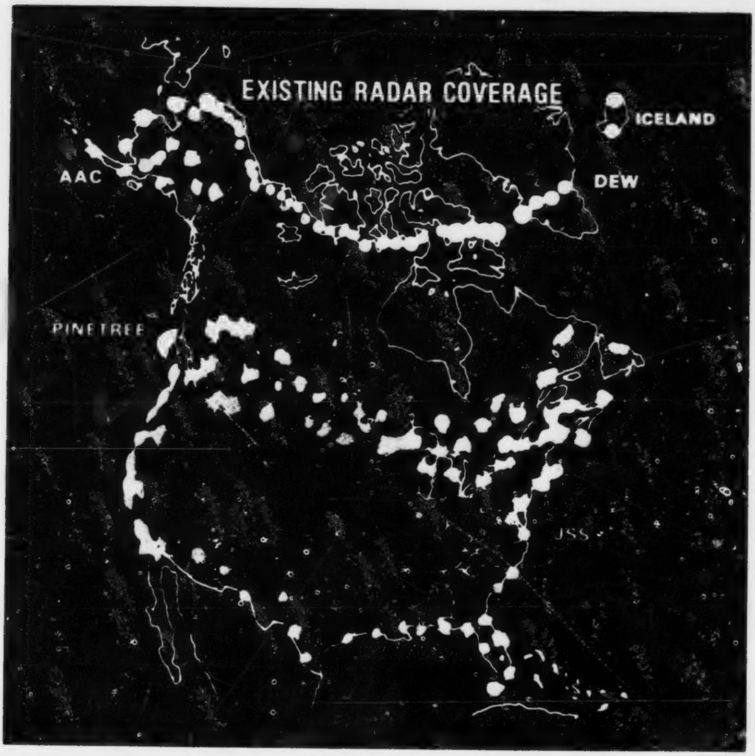
Senator STEVENS. What was that plane you showed in slide 34?

General KUTYNA. That is a BEAR.

Senator STEVENS. That is not new?

General KUTYNA. It is not new, but it carries a lot of the cruise missiles, which are shown on slide 35.

With the advent of these cruise missiles that the BEAR aircraft carries, we have become very concerned about our current ability to detect those systems.



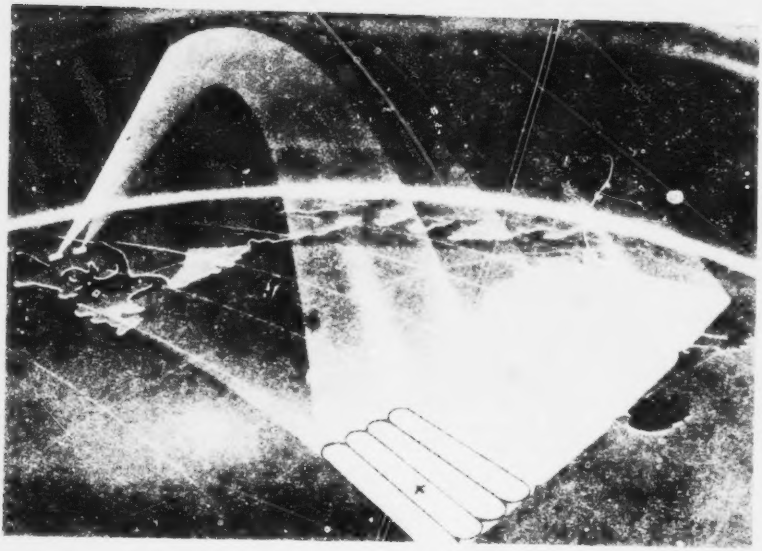
SLIDE 36

U.S. RADAR SYSTEM

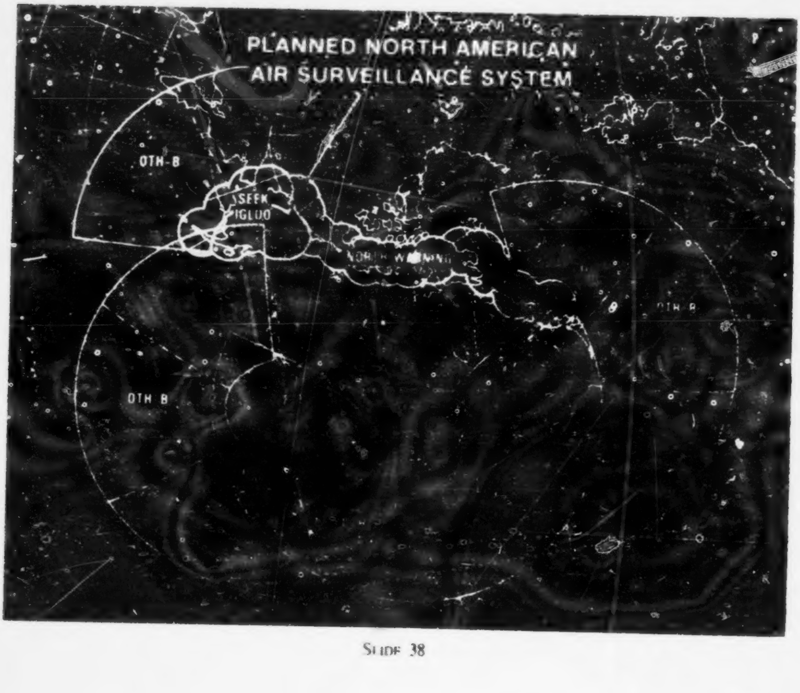
This is an artist's concept of our current radar system that will protect the United States and it is low level coverage. These green and red pieces are the coverage that we would get at low level.

We have the Joint Surveillance System with consists of radars in the United States. We have the Cadin Pine Tree which is the old Canadian radar system, the old DEW line in the northern regions of the Continental United States and Alaska, and Alaskan Air Command radars in Alaska.

While these served their purpose in years past, as you can see at low level with cruise missiles and bombers coming in, there are holes in the coverage and we must improve that system. We will rely primarily on a new concept called Over-The-Horizon radar.



Slide 37


PLANNED NORTH AMERICAN
AIR SURVEILLANCE SYSTEM
OTH-B
SEEK
IGLOO
NORTH WARNING SYSTEM
OTH-B
OTH B

Slide 38

OVER-THE-HORIZON RADAR SYSTEM

Current radars are limited to the horizon, maybe 100 or 150 miles. These OTH radars, as shown on slide 37, will bounce off the ionosphere and get an extended range which goes anywhere from 500 to 1,800 miles. So, they can overcome that limitation of the horizon.

We have developed this system over the past 12 years. We are putting it around the country. You can see the barriers on slide 38 that this will give us with this Over-The-Horizon Backscatter system.

We have purchased these three sectors and we started construction on this first sector. The next sectors will concentrate on the west coast and possibly on central sectors; and we are looking at sectors in Alaska.

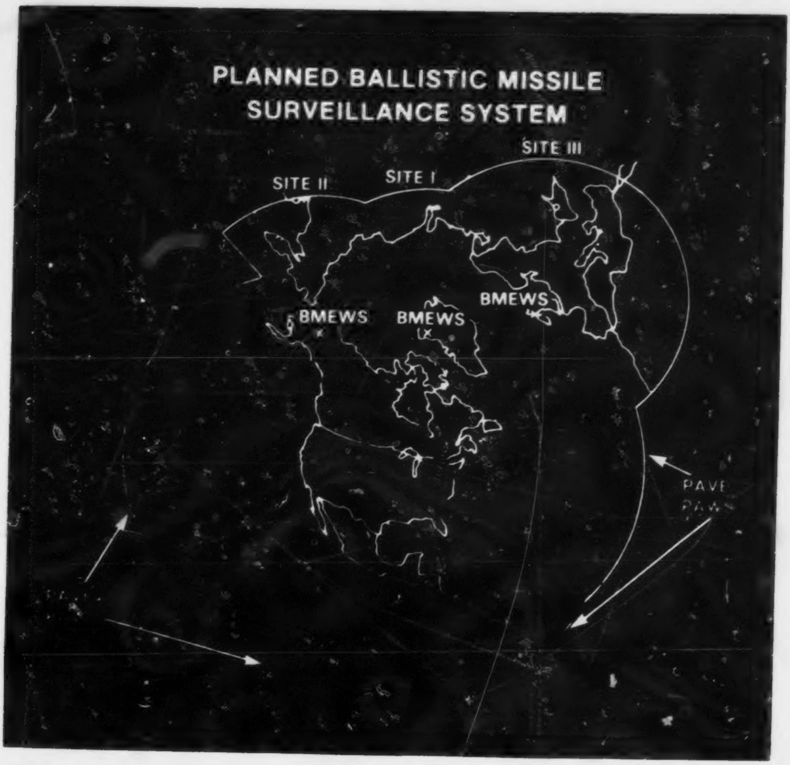
We have noted Soviet activity with cruise missile aircraft in this particular area on our west coast and we are thinking possibly of reording the sequence in which we would put these sectors in to give us protection.

In conjunction with that we have completed an agreement with the Canadians to upgrade the old existing warning line, DEW line, and we now call it the North Warning System. We will have several long-range radars that are minimally manned up there, but we are also inserting unmanned radars, 39 unmanned radars, to fill low level gaps we have up there.

That system is in development at this time. We are in agreement with the Canadians where we share the cost between us. That is tied in with the Alaskan system.

BMEW SYSTEM

Finally, let us look at the ballistic missile early warning system. Here on slide 40 is our old standby system up in Thule: four football fields size antennas. These were designed 20 years ago. They are being replaced by new technology (slide 41) called phased array radars such as the Pave Paws submarine launched ballistic missile detection systems that we currently have on our east and west coasts.



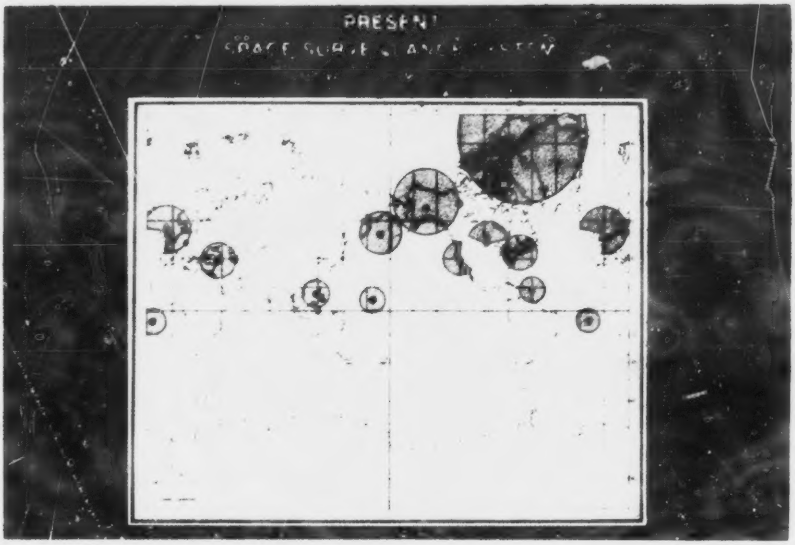
PLANNED BALLISTIC MISSILE SURVEILLANCE SYSTEM

SLIDE 42

COVERAGE FROM PAVE PAWS

Upgrade of the ballistic missile early warning system plus installation of four of these Pave Paws radars, two of which exist today, will give us this kind of coverage you see around the United States (slide 42) and will give us warning of those missiles coming in.

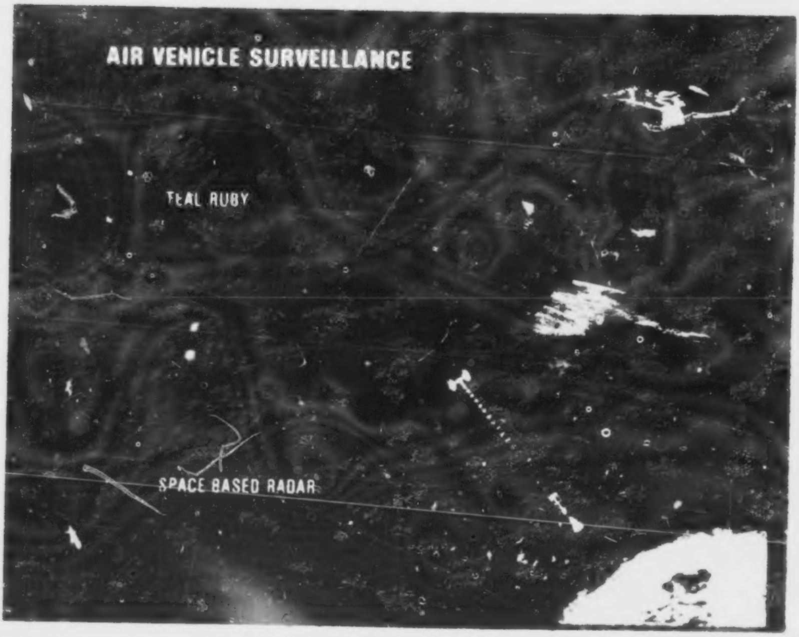
Slide 43



PRESENT

SPACE SURVEILLANCE SYSTEM

Slide 44


AIR VEHICLE SURVEILLANCE
TEAL RUBY
SPACE BASED RADAR

SLIDE 39

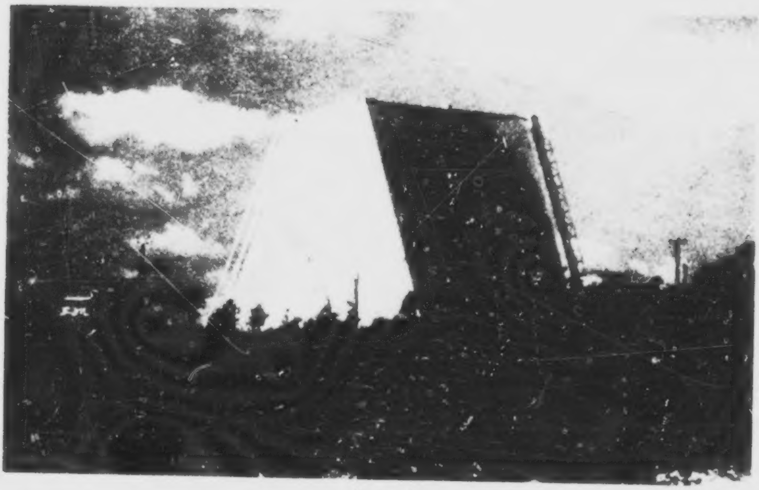
AIR VEHICLE SURVEILLANCE

The future in air vehicle survillance is in space. We are looking at infrared sensors that can see an aircraft or cruise missile. One experiment is called Teal Ruby. It will fly on the first shuttle mission out of Vandenberg.

Another idea is the space-based radar to detect some of these threats coming in. This program is ongoing and we are doing some of the research and development, early conceptual phases in the space-based radar program.

BMEWS SITE I THULE

Slide 40

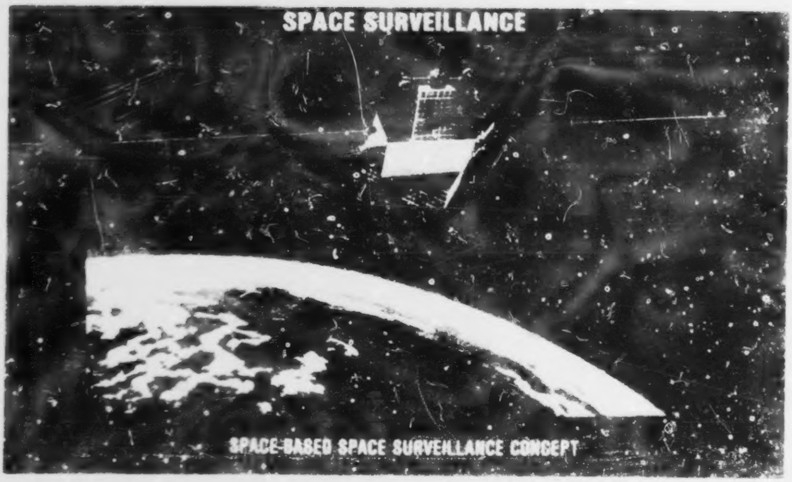


Slide 41

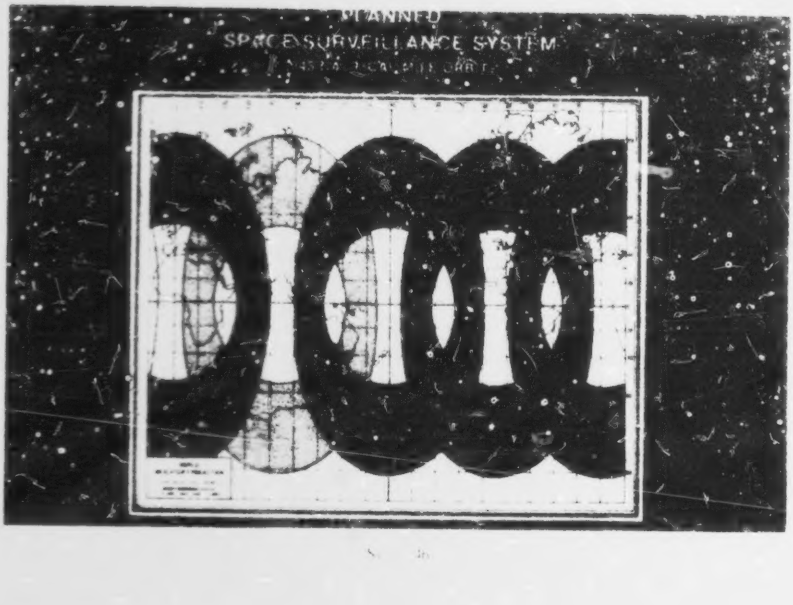
LIMITED GROUND-BASED SYSTEMS

For space surveillance, not of missiles, but objects in space, we have relied on a space detection system of ground-based radars and other sensors around the world. These have been sufficient.

However, they are also horizon limited. Unless satellites fly over one of these circles which show the limit of the horizon, you can't see the satellites. In many cases we can't wait until they fly over.


SPACE SURVEILLANCE
SPACE-BASED SPACE SURVEILLANCE CONCEPT

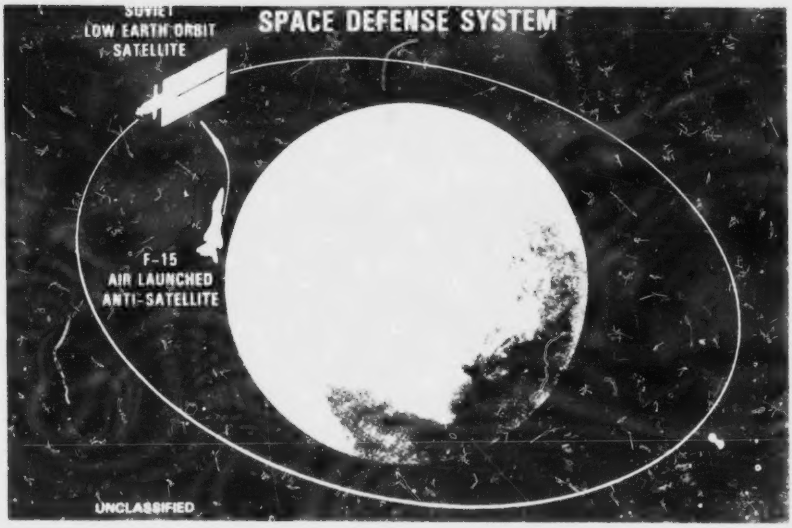
Slide 35


PLANNED
SPACE SURVEILLANCE SYSTEM

Slide 36

SPACE SURVEILLANCE

Therefore, we are developing a space surveillance system. This will be considered by General Abrahamson as contributing to the Strategic Defense Initiative research objectives, but it is an Air Force requirement. Once developed and deployed, it will give us coverage as shown here (slides 45 and 46). If a satellite flies over one of these circles, we will be able to pick it up (slide 46).



SPACE DEFENSE SYSTEM

SOVIET
LOW EARTH ORBIT
SATELLITE

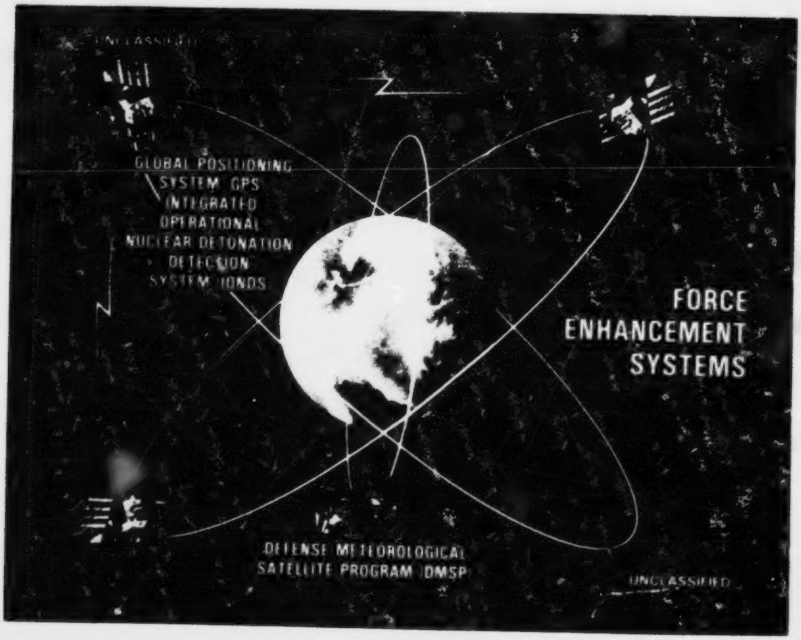
F-15
AIR LAUNCHED
ANTI-SATELLITE

UNCLASSIFIED

SPACE DEFENSE SYSTEMS

Finally, Space Defense Systems. As you are aware, we are working in the research and development on the F-15 air-launched antisatellite missile to intercept Soviet low altitude satellites (slides 47 and 48).

That will be controlled from the Space Defense Operations Center, Norad, Cheyenne Mountain. We have completed two tests on this program, not against an object in space. The next series will be against an object in space. We plan two tests of this vehicle in the summer.



UNCLASSIFIED

GLOBAL POSITIONING
SYSTEM GPS
INTEGRATED
OPERATIONAL
NUCLEAR DETONATION
DETECTION
SYSTEM IONDS

FORCE
ENHANCEMENT
SYSTEMS

DEFENSE METEOROLOGICAL
SATELLITE PROGRAM DMSP

UNCLASSIFIED

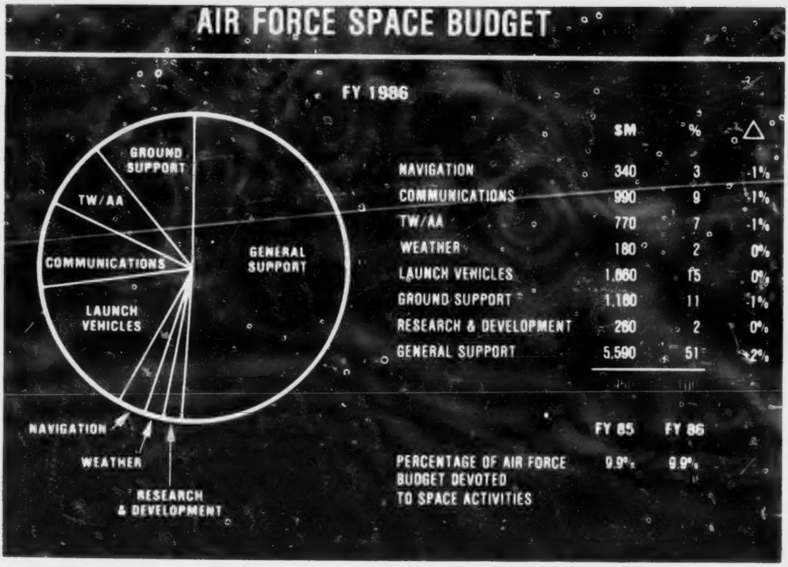
SLIDE 49

ASSISTANCE FROM SPACE FORCES

Finally, let me discuss how space forces help all our forces. Here are a couple of examples. Our meteorological satellites, DMSP. We have those on orbit to provide worldwide weather to our forces.

Just coming onboard now is a system called Global Positioning System, a system of 18 satellites circling the world which will give very accurate position, velocity, and time to our forces around the world, all day and night, all weather, anywhere.

This system also carries a nuclear detection system called IONDS that will allow us to see if there are nuclear detonations anywhere in the world or in space.



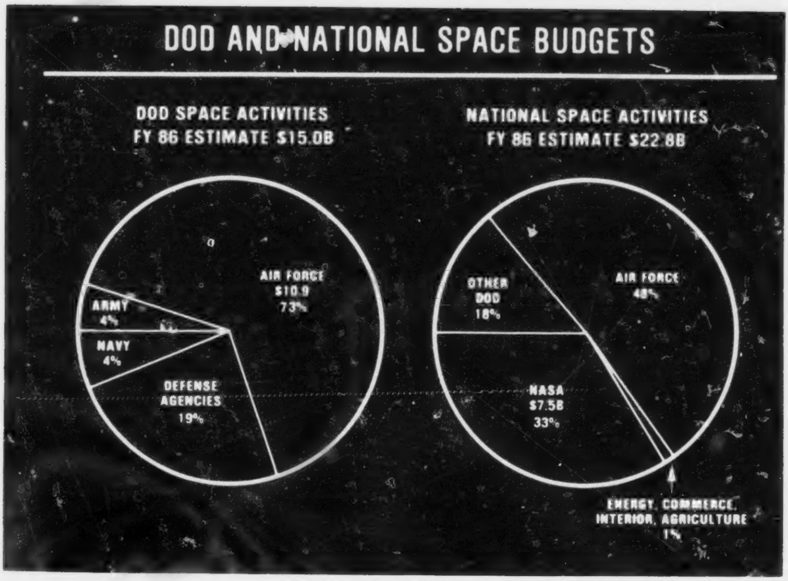
AIR FORCE SPACE BUDGET

FY 1986

	$M	%	△
NAVIGATION	340	3	-1%
COMMUNICATIONS	990	9	1%
TW/AA	770	7	-1%
WEATHER	180	2	0%
LAUNCH VEHICLES	1,660	15	0%
GROUND SUPPORT	1,160	11	-1%
RESEARCH & DEVELOPMENT	260	2	0%
GENERAL SUPPORT	5,590	51	+2%
	[illegible]	100	

	FY 85	FY 86
PERCENTAGE OF AIR FORCE BUDGET DEVOTED TO SPACE ACTIVITIES	9.9%	9.9%

SLIDE 50



DOD AND NATIONAL SPACE BUDGETS

SLIDE 51

DOD AND NATIONAL BUDGETS FOR SPACE

Here is a summary of my budget for space, as you can see, about $10.9 billion (slide 50). This has not changed much from 1985 to 1986. It still occupies 10 percent of the Air Force budget. You can see how it is broken out among the various mission areas (slide 51).

This delta column, the delta between 1985 and 1986 shows there is very little change in the various mssions that we fund in space over the years.

How does this fit in the entire DOD budget? Here you see the Air Force $10.9 billion being 73 percent of the $15 billion that DOD spends on space; the Army and Navy each spend 4 percent, and other defense agencies 20 percent.

In the overall national space picture, of $23 billion, the Air Force spends about 48 percent and NASA 33 percent.

Sir, that concludes my remarks. I will be standing by for questions.

[The statement of General Kutyna follows:]

PREPARED STATEMENT OF BRIG. GEN. DONALD J. KUTYNA, USAF
DIRECTOR SPACE SYSTEMS AND C^3
DEPUTY CHIEF OF STAFF, RESEARCH, DEVELOPMENT AND ACQUISITION

MR CHAIRMAN AND MEMBERS OF THE COMMITTEE

Thank you for the opportunity to talk to you today on the Air Force Space program and related Command, Control, Communications (C^3) requests for FY 1986. The budget you have before you represents a balanced program that maintains current capabilities, while adding critical mission performance enhancements and survivability features. While space and ground based systems are often addressed separately, in reality, they are highly interdependent in satisfying a broad spectrum of DOD missions. To illustrate this interdependence, the space and C^3 request can be examined in four broad areas: Space Launch Operations, Strategic C^3, Strategic Defense, and Force Enhancement from space. Each of these will be discussed by covering both space and ground based systems to show the complementary nature of their employment to satisfy our missions. However, before I begin, first let me discuss the uniqueness of space as a medium of operation.

IMPORTANCE OF SPACE SYSTEMS - Space systems have become an integral part of our military forces. They directly support both strategic and conventional forces by providing global capability from space for defense missions. Spaceborne surveillance, warning, communications, meteorological and navigation systems significantly increase the effectiveness of our forces today, and we fully expect these spaceborne capabilities to become even more important to our forces in the future.

The Soviets have long known the military value of operating in space and have committed significant resources toward a sizable space presence. The Soviet space program is under complete control of the military establishment. Moreover, the Soviets have spent great sums to develop a robust space presence that supports specific military and political objectives and provides space options that could significantly modify their strategic posture in relation to the U.S. The Soviets today have the only operational antisatellite weapon and continue to develop the most extensive and flexible launch capability in the world.

In July 1982, the President issued a National Space Policy directing a balanced civil and national security space program. As part of the national security space program, the Air Force established the Air Force Space Command to centralize and focus our military space activities. In November 1984, the President further authorized a new Unified Command, the U.S. Space Command, with participation of all four armed services.

SPACE LAUNCH AND OPERATIONS - To support U.S. space operations, an infrastructure of launch and on-orbit control facilities is required. The modernization, robustness, and survivability of that infrastructure is a critical part of our space planning and development activity.

The Space Shuttle is the primary means for providing DOD, government, commercial, and many foreign users routine access to space. The National Aeronautics and Space Administration (NASA) is responsible for developing and operating the Shuttle. The Air Force is the DOD executive agent for military applications of the Shuttle and is responsible for acquiring and operating the Shuttle
n site at Vandenberg Air Force Base, acquiring and operating
nsolidated Space Operations Center, developing the Inertial

Upper Stage (IUS), and jointly developing with NASA a common Centaur upper stage. I'm happy to report that we have resolved the IUS flight anomaly that occurred during the NASA sponsored Tracking and Data Relay Satellite (TDRS) launch in April 1983. IUS launch operations were resumed in January 1985 with a DOD payload. The IUS performance on that mission was exceptional.

The Space Launch Support program funds DOD Shuttle operations including those at Vandenberg Air Force Base, the orbiter flight charge reimbursements to NASA, and procurement of the Centaur G, IUS, and Payload Assist Modules Delta Class II (PAM-D II) upper stage vehicles. In Fiscal Year 1986, procurement funds are required to continue the PAM-D II multiyear procurement in support of the Navstar GPS program. Funds will be used for IUS vehicles modified to correct the previously mentioned flight anomaly, to fully fund three FY 1985 advance procurement IUS vehicles, and to provide logistics support for the IUS and the Vandenberg launch site. The 1986 request will continue funding for a Centaur G vehicle initiated in FY 1985. We will also seek to acquire another Centaur G vehicle to be funded incrementally in Fiscal Years 1986, 1987 and 1988 with the Research, Development, Test and Evaluation appropriation.

Under the Space Boosters Expendable Launch Vehicle (ELV) program, we currently acquire and launch Titan III (34)Ds and refurbish and launch Atlas E ELVs. Our last Titan III (34)D is scheduled for launch in FY 1988, and our last Atlas E will be launched in FY 1990. The Complementary Expendable Launch Vehicle (CELV) and conversion of the deactivated Titan II Intercontinental Ballistic Missiles into space launch vehicles as discussed by the Under Secretary of the Air Force's statement are also funded as a part of this program.

The Air Force Satellite Control Facility (SCF) provides on-orbit control for Department of Defense satellites from the Satellite Test Center (STC) at Sunnyvale Air Force Station, California, through a worldwide satellite control network which includes seven geographicallydispersed tracking stations. The current computer system in the Satellite Test Center is costly to maintain and becoming logistically unsupportable. In Fiscal Year 1986, we will continue development and acquisition of the Satellite Control Facility Data System Modernization program, which will correct these deficiencies and form the core configuration for operations at both the Satellite Control Facility and the Satellite Operation Complex segment of the Consolidated Space Operations Center. Fiscal Year 1986 funds will also continue development and acquisition of the Advanced Remote Tracking Stations to replace or refurbish the existing remote tracking stations and complement the Data System Modernization.

Our Fiscal Year 1986 request is needed to continue work on the new Consolidated Space Operations Center (CSOC). The CSOC will provide efficiencies (management, operational and economic) by combining two major space missions for the Department of Defense--satellite control and Space Shuttle military operations. The CSOC Satellite Operations Complex will share part of the satellite control workload with the Satellite Control Facility. A Shuttle Operations and Planning Complex will provide Shuttle flight planning and readiness support, and conduct Shuttle mission operations for DOD flights.

STRATEGIC COMMAND, CONTROL AND COMMUNICATIONS - Our strategic Command, Control, and Communications (C^3) systems are composed of fixed and mobile command centers and ground, airborne and space communications platforms. Collectively, these systems connect warning sensors, command and control centers and nuclear forces during peacetime and all phases of conflict. Due to its importance to deterrence, the upgrade of U.S. strategic C^3 was made the first priority of the President's strategic modernization program.

Although no one system can achieve all desired characteristics to meet current and projected threats, a proper mix of ground based and satellite systems with redundancy of critical C^3 nodes will provide high confidence that our strategic C^3 systems would survive and endure through the trans- and post-attack time periods. All elements of our strategic deterrent force, including the C^3 elements, must be perceived to be strong if our deterrent is to remain credible.

The Milstar satellite communications system will be the cornerstone of a survivable, jam-resistant and secure, worldwide communications system for the National Command Authority. It will support the strategic and tactical forces of all services. The Air Force is developing the satellites, system control equipment and airborne terminals, while the Army and the Navy are developing ground and seaborne terminals, respectively. Deployment of the Milstar system will begin in the late 1980s and continue into the 1990s.

The Air Force Satellite Communication (AFSATCOM) system's primary wartime function is to provide worldwide, two-way command and control communications for the National Command Authorities, the Joint Chiefs of Staff, the Commanders-in-Chief of U.S. strategic nuclear forces and other high priority users. Last year we achieved full operational capability with more than 500 ground and airborne terminals installed and operating. We are now upgrading AFSATCOM terminals to permit transition to the Milstar satellite communications system. By starting this effort now, virtually all the AFSATCOM terminals will be capable of using the Milstar spacecraft ultra high frequency channels after the first Milstar launch.

The Minimum Essential Emergency Communications Network (MEECN) insures delivery of critical messages under stressed conditions. The Ground Wave Emergency Network (GWEN) will provide the MEECN with its first C^3 system designed to meet the high altitude electromagnetic pulse (EMP) threat. GWEN will provide assured communications for the National Command Authority, major command centers, missile warning sites, and U.S. based nuclear forces. Survivable communications will be provided through a network of radio relay stations that interconnect user terminals at these installations. During Fiscal Year 1986, we will conduct initial operational test and evaluation and, with those test results, make a production decision. Full operational capability is planned for FY 1989.

The Defense Satellite Communications System (DSCS) provides super high frequency satellite communications for secure voice and high data rate transmissions to support both defense and diplomatic users. In FY 1984 we initiated an expanded advance buy of parts for seven DSCS III satellites. In FY 1985 we received authority to increase the scope of this contract to a full multiyear production contract. The Fiscal Year 1986 budget request provides full funding for two of the seven multiyear satellites.

STRATEGIC DEFENSE - Strategic defense forces and systems are key elements of our deterrent posture. These forces form the backbone of our ability to warn of aircraft and missile attacks, monitor space activities, and defend against atmospheric and space-based threats to U.S. forces. They insure that our National Command Authority's strategic retaliatory capability will survive any Soviet attempt at a first strike by providing timely, reliable, and unambiguous warning, as well as attack assessment.

Defense of North America against the air breathing threat is a joint U.S. and Canadian responsibility under the North American Aerospace Defense (NORAD) Command. Strategic air defense forces must provide timely, credible tactical warning and defense against enemy bomber, air-to-surface missile and cruise missile attacks. These surveillance and defense forces also control access to North American airspace in peacetime. Most of our operational air surveillance and defense systems were designed and deployed in the 1950's to meet a medium-to-high altitude bomber threat. Against today's low-altitude bomber and cruise missile threat, the capabilities of these systems are limited to very short ranges. These systems are also becoming increasingly expensive to operate and maintain.

The Over-the-Horizon Backscatter (OTH-B) radar will correct many deficiencies of the current surveillance network. The OTH-B radar provides long range, all altitude, wide area surveillance. The Air Force plans to deploy four OTH-B radar systems. The East Coast system will provide surveillance of the Atlantic from the Labrador coast (where it links the North Warning System) to Florida. Sectors of the East Coast radar system will be delivered to the Air Force in Fiscal Years 1986 and 1987. In Fiscal Year 1986, we will also begin procurement of the West Coast radar system to provide surveillance of the Pacific Ocean area from Alaska to Mexico. The third OTH-B radar system will be located in the Central U.S. It will provide surveillance of the southern approaches to the United States and will cover Atlantic and Pacific Ocean areas inside the 500 mile minimum range of the East and West Coast systems. The fourth system will provide air surveillance of the North Pacific for air defense of the Aleutian Islands. The Central and Aleutian systems will be deployed in the early 1990s.

In the north, the existing line of Distant Early Warning (DEW) radar stations will be replaced to provide credible long range all altitude coverage to complement OTH-B surveillance. The existing DEW Line radars are old, expensive to operate and maintain, and deficient in coverage and radar performance. The new system, called North Warning System, will consist of a total of 52 radar stations: thirteen long range, minimally attended radars and 39 short range, unattended radars. Upgraded communications to interconnect the radar stations and transmit data to the Joint Surveillance System Region Operation Control Centers is also part of the new program. Field deployment and site construction is being done under a new joint venture with Canada. In Fiscal Year 1986, communications upgrades will begin and development of the short range radar stations will continue. Both the OTH-B and NWS radars provide a capability to detect and track long range cruise missiles.

To complement our defenses against the atmospheric threat, a network of sensors provide our National Command Authorities with ballistic missile attack warning and assessment. These sensors provide warning of missiles launched from all fixed-site Soviet intercontinental ballistic missile launch areas and areas historically patrolled by ballistic missile submarines in the northern hemisphere. However, Soviet ballistic missile capabilities have improved to the point that we must upgrade and deploy new radar warning systems to insure adequate coverage and meet the modern, multiple reentry vehicle long range threat.

To accommodate the increased Soviet SLBM threat, two new PAVE PAWS radars are now under construction in the southeastern and southwestern United States. When these sites become operational, they will join the existing Northeast and Northwest PAVE PAWS radars and the Perimeter Acquisition Radar Attack Characterization System in North Dakota to form a five site phased array SLBM radar warning network. This network will provide 360 degrees of warning coverage around the United States, and also allow us to close the older, less capable AN/ FPS-85 and AN/FSS-7 SLBM radars currently in use. In Fiscal Year 1986, efforts will continue on these new PAVE PAWS radars at Robins Air Force Base, Georgia and Goodfellow Air Force Base, Texas.

The Ballistic Missile Early Warning System (BMEWS) modernization program is replacing existing 20 year old conventional radars at the Thule AB, Greenland, site with a new solid-state phased array radar. The new system will become operational in late 1986. This will improve system performance and capacity and provide better pre-impact assessment. In Fiscal Year 1986, we will also begin a similar modernization at the Fylingdales, England BMEWS site.

Our current space surveillance system is composed of three Ground-based Electro Optical Deep Space Surveillance (GEODSS) stations and a number of dedicated and contributing radar stations. Against today's threat these systems must be upgraded to provide improved low altitude coverage, high-altitude detection, and an ability to report space events in a timely manner. Our space surveillance and space defense programs will improve surveillance, increase survivability, develop an antisatellite system and enhance selected C^3 elements.

The SPACETRACK program will improve our ability to monitor space activities. In Fiscal Year 1986, we will begin testing at the GEODSS site in Diego Garcia; that site will become operational in FY 1987. The five-site GEODSS system providing global deep space surveillance will be completed in FY 1988. We also plan to improve SPACETRACK by refurbishing radar sensors and improving radar calibration for support of our future antisatellite system.

The Space Defense System program continues to develop a low altitude, air-launched miniature vehicle antisatellite system. The primary purposes of a United States antisatellite (ASAT) capability are to deter threats to space systems of the United States and its Allies and, within such limits imposed by international law, to deny any adversary the use of space-based systems that support hostile military forces. We plan to initiate low rate initial production in FY 1985 and continue production in Fiscal Year 1986 with the purchase of the second lot of ASAT missiles.

Command, control and communications are vital to effective integration, coordination and management of all space defense resources. The North American Aerospace Defense Cheyenne Mountain Complex Space Defense Systems program will develop the Space Defense Command and Control System in a phased approach to support the evolving space defense elements. During Fiscal Year 1986, the Space Defense Operations Center phased development will continue. An automated capability is being developed to support our space surveillance and space defense program.

The Defense Support Program (DSP) is a key element of our nation's strategic defensive posture. This program provides data to the National Command Authority, North American Aerospace Defense Command, and Strategic Air Command. Our development efforts are aimed at increasing the survivability of operational data through design of ground station modifications. These stations will be made compatible with the survivability improvements of follow-on satellites. In Fiscal Year 1986, we will take delivery of two DSP satellites, continue integration of DSP satellites with the Space Shuttle and continue ground station compatibility modifications.

FORCE ENHANCEMENT FROM SPACE - U.S. space systems significantly enhance the effectiveness of our ground forces. The global coverage and critical near realtime information that satellites provide are becoming increasingly important. In fact, many of the tasks performed by our satellites can only be done effectively from space. Several Air Force space programs are unique in their support of a broad spectrum of missions for the Department of Defense.

The Defense Meteorological Satellite Program (DMSP) is the DOD's single most important source of weather data. The program is a joint service program with the Air Force serving as executive agent. DMSP provides total earth coverage of meteorological, space environmental and oceanographic data to Air Force and Navy forecasting centers. The major DMSP Fiscal Year 1986 effort will be the continued design and development of an upgraded imaging sensor and the initial development of the associated Titan II Space Launch Vehicle qualified spacecraft.

The Navstar Global Positioning System (GPS) is a space-based radio navigation system which will provide Joint Service users highly accurate three-dimensional position, velocity and precise time under all-weather conditions on a worldwide basis. When fully operational at the end of 1988, GPS will enable land, air, and sea forces to navigate with extremely high accuracy and be independent of limited range terrestrially based navigation aids. Successful GPS development led to the award of a multiyear production contract for 28 satellites in FY 1982. In Fiscal Year 1986, we are requesting funds to continue the GPS multiyear contract. Those funds will be used to complete the purchase of nine of the multiyear satellites. The first GPS production satellite launch is planned for late 1986.

The Nuclear Detonation Detection System (NDS), also known as the Integrated Operational NUDET Detection System (IONDS), consists of sensors that will be carried on Navstar GPS satellites. When used with the precision frequency standards of the GPS, these sensors will determine nuclear detonation location, time and yield. In Fiscal Year 1986, we will continue development of the NDS user terminals and acquisition of the operational satellites. A full NDS capability will be achieved in 1988 when the GPS satellite constellation is in place.

Biography
United States Air Force
Secretary of the Air Force Office of Public Affairs, Washington D C 20330

BRIGADIER GENERAL DONALD J. KUTYNA

Brigadier General Donald J. Kutyna is the director for space systems and command, control, communications, Office of the Deputy Chief of Staff, Research, Development and Acquisition, Headquarters U.S. Air Force, Washington, D.C. In this capacity he is responsible for providing the requirements, direction and budgetary support for the development and acquisition of all Air Force space programs, atmospheric and space surveillance and warning systems, and the major Air Force and Department of Defense tactical and strategic communciations capabilities.

General Kutyna was born Dec. 6, 1933, in Chicago. He graduated from Chicago's Lane Technical High School in 1951, attended the University of Iowa for two years, and subsequently was appointed to the U.S. Military Academy, West Point, N.Y., graduating with a bachelor of science degree in 1957. He received a master of science degree in aeronautics and astronautics from the Massachusetts Institute of Technology, Cambridge, in 1965, and graduated from the Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C., in 1976.

Upon completion of pilot training at Vance Air Force Base, Okla., in September 1958, General Kutyna was assigned to the 33rd Bombardment Squadron at March Air Force Base, Calif., as a B-47 combat crew member until June 1963. Following graduation from the Massachusetts Institute of Technology in June 1965, he was assigned to the Aerospace Research Pilot School, Edwards Air Force Base, Calif., first as a student and then as a staff member, training test pilots and astronauts for U.S. aircraft and space programs.

From November 1969 to October 1970, he served a combat tour of duty with the 44th Tactical Fighter Squadron at Takhli Royal Thai Air Force Base, Thailand, flying F-105 tactical fighters. He completed 120 combat missions and served as flight commander and on the wing staff. Upon his return from Southeast Asia, General Kutyna was assigned to Air Force headquarters as a development planner in the Office of the Deputy Chief of Staff for Research and Development. In January 1973 he assumed duties as a member of the Air Force Scientific Advisory Board Staff and, in June 1973, he was assigned as executive officer to the under secretary of the Air Force.

In August 1975 he entered the Industrial College of the Armed Forces. After graduation in July 1976, he transferred to Electronic Systems Division, Hanscom Air Force Base, Mass., with duty as assistant deputy for international programs. He also served as program manager for foreign military sales of the E-3A Airborne Warning and Control System aircraft and later as assistant director for the overall E-3A program.

General Kutyna became deputy for surveillance and control systems at Electronic Systems Division in June 1980. In this position he was responsbile for the development, acquisition and deployment of electronic systems to include deep space sensors, ballistic missile warning radars, air defense warning systems, air and space defense command centers, air traffic control systems, and several foreign military sales programs.

In May of 1982 General Kutyna became deputy commander for space launch and control systems at Space Division, Air Force Systems Command, Los Angeles Air Force Station, Calif. In this position he managed the Department of Defense Space Shuttle Program to include the design and construction of the West Coast shuttle launch and landing site at Vandenberg Air Force Base, Calif.; the acquisition and deployment of space shuttle upper stages -- the Inertial Upper Stage and the Centaur; and the integration and operational aspects of launching all military payloads on the shuttle. Other responsibilities included the development, acquisition and launch support of all Air Force expendable launch vehicles -- the Titan, Atlas and Thor space boosters and their upper stages. His programs for control of space missions encompassed the operation and upgrade of the Air Force satellite control network, development of Space Command's Consolidated Space Operations Center, and the modification of National Aeronautics and Space Administration space shuttle command and control facilities to handle Department of Defense operations. He assumed his present duties in June 1984.

The general is a command pilot with more than 4,000 flying hours in 25 different fighters and bombers. His military decorations and awards include the Distinguished Service Medal, Legion of Merit with one oak leaf cluster, Distinguished Flying Cross with one oak leaf cluster, Air Medal with eight oak leaf clusters and Air Force Commendation Medal with two oak leaf clusters.

He was promoted to brigadier general Aug. 1, 1982, with same date of rank.

General Kutyna is married to the former Lucille Moellering of Iowa City, Iowa. They have two sons.

SPACE PLANE REQUIREMENT

Senator **Stevens**. Thank you very much.

Senator D'Amato wanted to ask a question about military space planes.

Could you tell us what are those requirements?

Mr. **Aldridge**. We are doing a study right now at Aeronautical Systems Division to determine if there is a possible mission for that particular aircraft. It is obviously quite a period in the future before we will have that aircraft developed.

At this time we are looking at things like reconnaissance, possibly weapon delivery, those kinds of things, but those studies have not yet been completed.

Senator **Stevens**. He may return and pursue the matter further.

We follow a policy here of recognizing the Members as they come into the committee for 10 minutes. I would ask both of you as witnesses to remember that these Senators have limited time when you respond.

Senator **Kasten**. Mr. Chairman, I have to be in another meeting. I would like to ask unanimous consent to submit a couple of questions for the record?

Senator **Stevens**. Thank you very much.

Senator Proxmire.

Senator **Proxmire**. Thank you, Mr. Chairman.

SPACE BASED LAUNCH NEEDS

When Congress approved the Space Shuttle Program, we were given assurances that the shuttle would fulfill all Air Force space-based launch needs. We were told it would have a shorter turnaround time, cheaper alternative to expendable launch boosters.

I did not agree with that. I thought they were wrong. Now you say you need new expendable launch boosters to hedge against problems of the shuttle and crisis conditions, suggesting that the shuttle cannot be used in all situations.

Was Congress sold a bill of goods when we were told how successful it would be, we wouldn't have to have expendables?

Mr. **Aldridge**. I think the people at NASA who testified before the committee firmly believed——

Senator **Proxmire**. The Air Force testified to this, incidentally.

Mr. **Aldridge**. Yes, sir.

Senator **Proxmire**. There is no dissent. There is not one word of any dissent on that.

Mr. **Aldridge**. I will tell you why that is the case. At the time we were predicting that the shuttle in those time frames was going to cost about $10 million a launch. The expendable that we were launching, Titan III-C's at that time, were going to cost about $30 million a launch which is what we were actually spending.

We thought at the time that the shuttle fleet would be a fleet of five vehicles, possibly more. We looked at the shuttle performance in terms of its flexibility and its design and all vehicles were going to be exactly the same and, therefore, completely interchangeable and that the program was pretty well thought out, fully operational, we would get 160 hours of turnaround, which is about 7 days between flights to re-fly.

Unfortunately, none of those conditions or factors that we thought of at the time has come true. The shuttle is no longer one-third of the launch cost of $10 million a launch. The reason we were happy with that low cost is because then we could do what we wanted to do and that was to put the funds for space into the satellites as opposed to putting it into the launcher.

LAUNCH COST

Senator **Proxmire**. You say the cost would be $10 million per launch?

Mr. **Aldridge**. That was the estimate at the time.

Senator **Proxmire**. What is the actual cost now?

Mr. **Aldridge**. Sir, that is a very difficult question to answer.

Senator **Proxmire**. Roughly. Your argument is that it is a lot bigger?

Mr. **Aldridge**. I will give you a simple answer. If you take the NASA shuttle budget in fiscal 1986 which is before the Congress and divide by the number of flights which are planned in fiscal 1986, it will cost $250 million a flight to the taxpayer. That is the total cost.

Senator **Proxmire**. Twenty-five times as much as they told us it would cost; is that right?

Mr. **Aldridge**. According to that figure, that is right. NASA will also claim the marginal cost is about $30 million. Once you have flown 24 flights per year, the marginal cost is $30 to $35 million.

The problem has been that as we have looked from where we started with the Air Force fully supporting the shuttle, and, incidentally, we will fully support the shuttle because we have to, it is required, we have to use that shuttle because it provides a unique capability for the Air Force that we must have.

Senator **Proxmire**. I don't dispute that. I just want to get those facts. The Air Force pays $55 million, I understand, not the $250; is that right, per flight?

Mr. **Aldridge**. Yes, sir.

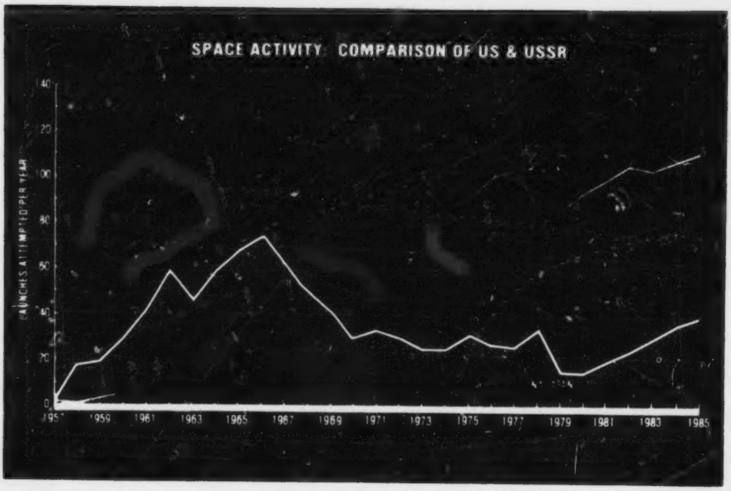
Senator **Proxmire**. The total cost is $250?

Mr. **Aldridge**. That is the cost to the taxpayer.

Senator **Proxmire**. Why didn't the Air Force speak out at the beginning of the Space Shuttle Program and express its reservations to the Congress about the program?

Mr. **Aldridge**. I believe at the time if the cost per launch was correct and we could in fact use those funds for space to get our satellites up and we could have a robust fleet of satellites which we could look at, launch, store on orbit, and other kinds of factors that would give us the confidence in the program, then we were happy to have that low cost per launch to get the money in the satellite.

Unfortunately, that did not occur. Also, at the time we felt it was five orbiters or more and with the turnaround time predicted, that our requirement could at least be met, at least with some reasonable degree of confidence.



(DUPLICATE OF SLIDE 20)

RUSSIAN LAUNCH CAPABILITY

Senator **PROXMIRE**. General, I think you had the chart up there, you made the point that the Russians continue to develop the most expensive and flexible launch capability in the world. That means they have a more extensive and flexible launch capability than the shuttle gives.

The chart, as I recall, showed the Russians would have increased superiority as time goes on. The chart shows by 1995 they would be ahead.

General **KUTYNA**. Yes, sir.

Senator **PROXMIRE**. They don't use shuttles. They use expendables. It seems to me they have more flexible launch capability than the shuttle gives us; is that right?

General **KUTYNA**. I believe they do.

Senator **PROXMIRE**. How do you square that with the fact that the Air Force recommended, the administration recommended in the past we go with the shuttle?

You showed us that you expert to have 80 percent of your flights with the shuttle. They don't have the shuttle. Yet they are way ahead. They will be ahead increasingly as time goes on.

Why is that?

General **KUTYNA**. That is why we are asking for the expendable launch vehicles. It gives us dual capability. I think things have changed since we made those original decisions.

Secretary Aldridge commented on the cost. We thought the shuttle would do it alone. I think we were wrong at that time.

Senator **PROXMIRE**. But they are behind us in shuttle technology; is that right?

General **KUTYNA**. Yes, sir.

Senator **PROXMIRE**. Development and testing, and so forth?

General **Kutyna**. Yes, sir.

SDI SHUTTLE BASED EXPERIMENTS

Senator **Proxmire**. As I understand it from the report to the Congress on SDI, acquisition, tracking and pointing, space-based imaging experiments, they may be conducted aboard the shuttle in the late 1980s.

The SDI organization says these experiments will be conducted at low performance levels in order to circumvent the ABM Treaty ban against components testing. It remains to be seen, however, whether the Soviets will go along with the interpretation.

When once we begin the SDI experiments on the shuttle, does this in fact pollute the predominant nature of the shuttle?

Doesn't the shuttle become an arm of our Strategic Defense Initiative, particularly in the eyes of the Soviets?

There will be no way to identify whether the shuttle is on a civilian or military mission.

Mr. **Aldridge**. The shuttle has always been a major component since the decision started in the 1970s and according to the agreement in 1978, the shuttle would be a major part of delivery of military satellites to space. It has always been that way.

It was sold on that basis and conducting a series of experiments, I don't believe, really pollutes the orbiter in that regard.

RELATIONSHIP OF SHUTTLE TO SDI

Senator **Proxmire**. The question I am asking is about the relationship of the shuttle to the SDI program that would foul up the other operations.

Beginning in the late 1980's, what is the planned number of flights per year on the shuttle?

Mr. **Aldridge**. We are just beginning to get a determination of the number of flights. I have seen only two years of estimates, running 1988 and 1989, of about two to three flights per year. That is only during this period of the technology demonstration.

If we ever got to the point of deployment, the number could exceed 50 per year. Right now our commitment is eight flights per year and we think that that could be as high as a couple more per year depending on SDI and at what rate they reach.

Senator **Proxmire**. If SDI moves at 50, obviously, you will have to have more shuttles.

Mr. **Aldridge**. Sir, I think we would go to something other than shuttles. Fifty flights per year in the mid-1990's and $100 million per flight, which is a conservative estimate, we are talking about $5 billion a year before we can even launch the first satellite.

Senator **Proxmire**. Is that figured in the SDI cost yet?

Mr. **Aldridge**. No, sir, I don't believe there is an SDI cost at this point.

Senator **Proxmire**. What other payloads will have to be bumped when the SDI shuttle flights begin?

Mr. **Aldridge**. I don't believe there is any estimate of any satellites that will be bumped at this point in time. I don't know of any that are planned.

The manifest is for 24 flights per year. I believe NASA believes they can meet all their user requirements up to the point SDI exceeds two or three flights per year.

Senator **Proxmire**. General, you mentioned in your testimony that our strategic air defense surveillance, defense systems, were designed and deployed in the 1950's. They have limited capability against today's low altitude threats.

COST TO DEPLOY MODERN AIR DEFENSE SYSTEMS

How much would it cost to deploy modern air defense systems for the Continental United States and Canada, including radar associated satellites, air defense interceptors, and how much would it cost to operate and maintain the systems?

General **Kutyna**. I would have to supply the number of interceptors for the record. I can tell you the Over-The-Horizon Backscatter radar program is $2.3 billion.

Our North Warning System, which caps that old Distant Early Warning line, the DEW line, is about $1.3 billion.

AIR DEFENSE INTERCEPTORS

Senator **Proxmire**. That does not include the air defense interceptors?

General **Kutyna**. Not all.

Senator **Proxmire**. That would be larger in all likelihood?

General **Kutyna**. Yes, sir.

Senator **Proxmire**. Do you have an estimate of what that would be?

Mr. **Aldridge**. We have 300 interceptors maintained for air defense. If you want to replace them with F-15s, we would like to have F-15's or 16's, on the order of $10 or $15 million a copy at that point in time, that would be several billion dollars.

OPERATIONAL COSTS

Senator **Proxmire**. You can't give us an estimate of how much it would cost to operate and maintain that kind of system?

Mr. **Aldridge**. Yes, sir, we can. We would have to add things like how many AWACS would be deployed under the system because you would need AWACS for survivability.

You would have to have the command and control system to make sure the AWACS could talk to the interceptors.

Senator **Proxmire**. If you would do something like this for the record, I would appreciate it very much.

Mr. **Aldridge**. Yes, sir.

[The information follows:]

Cost To Deploy Modern Air Defense Systems

Deployment of a modern air defense system for North America will require funding by both the U.S. and Canada. The U.S. share of the acquisition cost will total approximately $15 billion (then year dollars). The yearly operations and support cost of the air defense systems is estimated at $940 million (in FY 91). The air defense system will include the North Warning System (NWS), Over-the-Horizon Backscatter (OTH-B) Radars, Joint Surveillance System (JSS), [deleted] E-3 Airborne Warning and Control System (AWACS) aircraft (which will support NORAD during air defense operations), and modern interceptors (F-15 and F-16). Nearly $7 billion of the $15 billion acquisition cost has been appropriated through FY 1985.

Canada plans to spend $607 million (U.S.) to upgrade the air defense system. They will pay for about 40% of the acquisition cost of NWS, develop forward operating bases for the AWACS aircraft, and acquire coastal radars as necessary. Canada also plans to buy 138 CF-18 interceptors (not included in the $607 million).

Advanced air defense sensors (ground, air, and space-based) are in the early stages of laboratory development. Of the many technologies being developed, only a few will be selected for full scale system development and acquisition. It is too early to accurately project the cost for even one of these sensor systems, much less the total cost of such an enhanced air defense system.

ELV MISSIONS

Senator Proxmire. I have other questions for the record.

Senator Stevens. Thank you, Senator.

Senator Sasser, you are second.

Senator Sasser. Thank you, Mr. Chairman.

Mr. Secretary, you have missions designated for each of the ten ELV's that you hope to purchase.

Mr. Aldridge. Yes, sir, we do.

Senator Sasser. Why can't you use the shuttle for each of these missions?

Is there any specific reason why this can't be done?

Mr. Aldridge. Yes, sir, they could. In fact, two of the missions will be compatible to fly either the shuttle or the ELV.

Senator Sasser. You say two of the missions.

Mr. Aldridge. We have three missions. One of them is a Defense Support Program, one of them is Milstar, and the other one is a classified program which I can't go into in this hearing.

Two of those three will be dual compatible to go either on the shuttle or ELV and the third one will be made that way at a block change when it is convenient to do so.

Senator Sasser. You want 10 ELV's?

Mr. Aldridge. Yes, 10, flying two per year. We will fly various combinations of those two times a year.

TOTAL COST OF ELV PROGRAM

Senator Sasser. You may have told us this and I didn't get it precisely, but what is the total cost of the ELV program, that is, procurement, R&D, and all the associated costs?

Mr. Aldridge. We have a fixed-price proposal from Martin-Marietta for the development, the production and launch operations of the 10 ELV's at $2.1 billion. There will be some additional cost to the Government and the Air Force for its program management support and things like that, but basically $2.1 billion is the cost to procure and launch 10 flights.

General Kutyna. There is another $100 million launch incentive on that $2.1 billion, sir.

AIR FORCE SPACE SHUTTLE ORBITER

Senator Sasser. Some have suggested that perhaps the Air Force should build its own space shuttle orbiter.

What is the position of the Air Force on this?

Mr. Aldridge. No, sir. The way we felt is that the way you get maximum efficiency of the orbiter is to have a fleet of vehicles and not have the Air Force have its own blue shuttle operate by itself because we would be subject to essentially economies of scale of having one vehicle that has to work for us all the time.

It would be better, if we were going to buy another orbiter, for the country to put it into the fleet of orbiters so that we can choose among any one of them that would be available at any given time. It is better to draw from a fleet than to have a single one for our purpose only.

SHUTTLE VERSUS ELV MISSION COSTS

Senator SASSER. Let us suppose that the Congress approves the ELV program that you request. For each specific mission, which would cost more to operate, the shuttle or the ELV?

Mr. ALDRIDGE. The answer to that depends on what is the pricing policy that is utimately decided on the cost of the shuttle. We have an agreement now with NASA by which we pay about $55 million, I believe that is in 1982 dollars, for flying the orbiter.

It will climb to about $64 million in 1984, but that pricing policy ends in fiscal year 1988.

Now we are going through a process of renegotiating that pricing policy. The cost that we provide, that we pay to NASA is one thing. The cost that it actually costs the taxpayer to fly the orbiter, because there is a subsidy to that cost that we pay——

Senator SASSER. Sort of like Amtrak?

Mr. ALDRIDGE. Yes, sir, very much like Amtrak.

So, depending on whether it is in our budget where we pay the $55 million or whether, as I mentioned in the calculation of the total cost, about $250 million per flight for the 1986 budget for NASA's launching in fiscal 1986, depending on what numbers you have, you can come to different answers on about how much does it cost the ELV versus the shuttle.

Senator SASSER. What is the total cost of the shuttle flight? $250 million?

Mr. ALDRIDGE. I used the calculation, I took the fiscal year 1986 shuttle budget for NASA and divided by the number of flights planned, which I believe is 12 in 1986, and that came to about $250 million.

Senator SASSER. What is the projected cost of each mission using the ELV's? $2.1 billion you are going to spend?

Mr. ALDRIDGE. Yes, sir. That includes 10 Centaurs at $45 million apiece which would fly whether or not you had an ELV or shuttle. That would be a common cost to either side.

I believe the total cost per launch of the ELV is about $100 million.

Senator STEVENS. That is apples and oranges, though?

Mr. ALDRIDGE. Yes, sir. That is $100 million cost to the taxpayer. How you compare that to the cost of the shuttle would depend on what is the pricing policy and the flight rate at that point.

Senator SASSER. I may have additional questions, Mr. Chairman, which I will submit for the record.

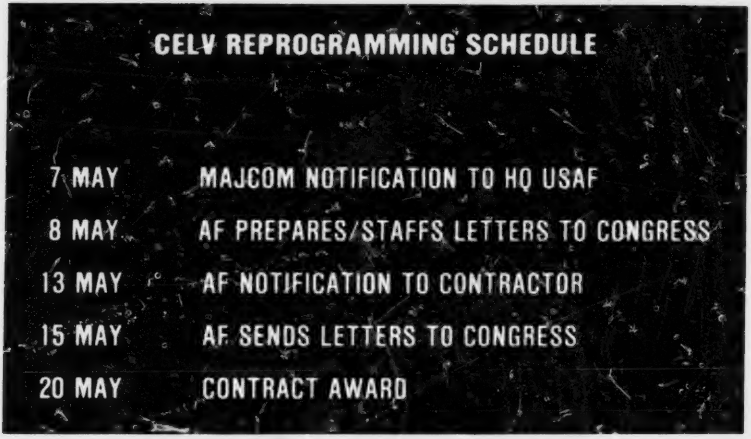
Senator STEVENS. Excuse me for interrupting.

Senator SASSER. That is quite all right. I finished my line of questions.

ELV REPROGAMMING

Senator STEVENS. Mr. Secretary, we have a request for reprogramming for $30 million to begin development of the Titan 34D7. I intend to try to get it approved today. We have some indication that one, maybe two members of the committee may object. Under that circumstance, we will poll the committee.

Can you tell me, I am not quite sure what is the timing, what is the final deadline for reprogramming and why?



CELV REPROGRAMMING SCHEDULE

7 MAY	MAJCOM NOTIFICATION TO HQ USAF
8 MAY	AF PREPARES/STAFFS LETTERS TO CONGRESS
13 MAY	AF NOTIFICATION TO CONTRACTOR
15 MAY	AF SENDS LETTERS TO CONGRESS
20 MAY	CONTRACT AWARD

SLIDE 52

CONTRACT WITH MARTIN-MARIETTA

Mr. ALDRIDGE. The contract we currently have, we put a contract out with Martin-Marietta for $5 million based on funds appropriated for fiscal year 1985. That contract terminates May 20.

When you back up all the notification procedures under a normal practice, we would need the reprogramming approved as of today.

Senator STEVENS. That is a hard court press. We didn't get this thing until when, yesterday?

Mr. ALDRIDGE. No, sir. March 4 it was delivered to the Congress.

Senator STEVENS. I am sorry. I was misinformed.

Has any other committee approved it yet?

Mr. ALDRIDGE. There are two pieces of the reprogramming.

Senator STEVENS. I am talking about the $30 million.

Mr. ALDRIDGE. I don't believe any of the committees have approved. I know the Senate Armed Services Committee was in the process of approving it, but I don't think it has been done yet.

Senator STEVENS. We will do our best to get it out today.

What if we don't get it done today?

Mr. ALDRIDGE. We will make it work whenever we get it, sir.

Senator STEVENS. That is the trouble with deadlines. If trains leave the station late, more trains don't leave the station.

Do you know what I mean?

Mr. **Aldridge**. Yes, sir.

Senator **Stevens**. You should give us a deadline that is a deadline.

Mr. **Aldridge**. Yes, sir. Today is the deadline according to our plan.

Senator **Stevens**. Senator Andrews, do you have a time problem?

Senator **Andrews**. I have to catch a plane. It is OK with Senator Rudman.

Senator **Stevens**. You may go ahead.

Senator **Andrews**. Thank you, Mr. Chairman.

Mr. Secretary, I will have questions for the record, but I would like to ask a couple while we are here.

ASAT TESTING

As you know, the Senate adopted an amendment for the fiscal 1985 authorization bill allowing the ASAT test only if the President certifies the United States is endeavoring to negotiate the strictest possible limitation on ASAT's with the U.S.S.R., that ASAT testing is necessary to avert a clear harm to national security, that ASAT testing would not constitute an irreversible step that would gravely impair the prospects for negotiations, that the ASAT test does not violate obligations under the ABM Treaty.

Congress would have 30 days to review a Presidential decision to go ahead with ASAT testing before the testing could occur.

Could you give this subcommittee any information or update on how these conditions are going to be complied with on upcoming ASAT tests?

Mr. **Aldridge**. Yes, sir, I can give you a brief summary of that.

We plan to conduct the tests this summer. Prior to that test—as a matter of fact, we briefed the Secretary of Defense on our plans several weeks ago, and the procedure for the notification and verification by the President to the Congress is in process at this particular time.

He believes he will, in fact, certify the need to conduct that test and we will proceed with the test sometime probably in [deleted].

Senator **Andrews**. As the Chairman said a minute ago on another issue, what timeframe do we get the notification prior to [deleted].

Mr. **Aldridge**. I believe it is 30 days, at least 30 days prior to the test.

Senator **Andrews**. Fine. One other question.

COMMERCIAL EXPLORATION OF SPACE

As the Senate considers the fiscal 1986 budget, a lot of work and attention is being devoted to eliminating redundancy and overlap in the various programs.

When I was in Houston a year or so ago, I went out to NASA. Of course, they told me about their programs. You told us about your programs. Certainly in various defense programs there is considerable overlap.

What assurances can you give this subcommittee that DOD and the private sector of NASA and the private sector are working in tandem on commercial exploration of space?

Mr. **Aldridge**. Commercial exploration is really not a Defense Department issue.

COMPLEMENTARY EFFORTS

Senator **Andrews**. I know that, but a lot of spin-offs become commercial that are used in the military and the need is there, obviously, for cooperation. If we are spending through another subcommittee billions of dollars for NASA, those research findings ought to be tied in with what we are doing with you.

Mr. **Aldridge**. Yes, sir. We have an Aeronautics and Astronautic Coordinating Board that meets between the technology people in the Defense Department and the NASA people. They meet periodically to review their programs to assure there is no duplication of effort and that what we are doing is, in fact, complementary.

I personally meet with the NASA people twice a month during which we talk about all the issues, about the shuttle and launch capability, to make sure there is no duplication of effort. We are, in fact, coordinating.

I don't believe in DOD and NASA there is any problem or wasted effort in regard to having any of the research and development.

Senator **Andrews**. In other words, you know what they are doing and they know what you are doing and you are not inventing the same apple, shall we say?

Mr. **Aldridge**. We hope that is the case. I can't absolutely, positively guarantee. There may be a few projects that might be duplicative. In fact, I believe we are doing a good job.

Senator **Andrews**. These programs are extremely important, they are extremely costly. It is a great concern to me when I go to Houston and talk to them and they sort of say we are not quite getting the cooperation that we could.

DUPLICATION

We hear off the record from some of your people, maybe if we knew a little bit more about what those fellows were doing in their shop, we could save some duplication.

That is the concern we have, the people we represent, in putting forth these funds.

If you could provide our subcommittee with some examples of how you work together and how you have these lines of communications, it would be helpful.

Mr. **Aldridge**. We will be delighted, sir.

Senator **Andrews**. Thank you very much.

[The information follows:]

Commercial Exploration of Space

In line with the President's directive on space commercialization, the DoD is making every effort to facilitate commercialization without subsidy. The established mechanism is through the Department of Transportation's Office of Commercial Spaceflight. We have an excellent rapport and a highly effective working relationship with the DOT office. We worked closely with them in the establishment of the necessary DoD policies and directives to allow us to charge commercial customers of our National Test Ranges at rates which will facilitate their efforts. Further, we have detailed two officers to the DOT specifically to work on aiding the DOT in dealing with space matters where the DoD is concerned.

RELATIVE COSTS

Senator **Stevens**. Senator Rudman.

Senator **Rudman**. Before Senator Andrews leaves, I would like to phrase the question differently. You know what they are doing and they know what you are doing.

The real question is: Do we know what you are both doing?

I can tell you, Mr. Secretary, I am not sure that I know. I am having a lot of trouble following the numbers here.

I am going to suggest to the chairman that we get the budget people from NASA and yourself at one table to find out what is going on. I do not think it is at all fair or accurate, to take the total NASA budget, divide it by the number of launches, and assume that is the cost of the shuttle.

I know that NASA is doing many other things. The question is, what is their pricing policy?

Nobody asks the American taxpayers on April 15, what is your pricing policy. They say that is what you are going to pay.

If NASA wants to have a loss leader and launch crackerjacks at $18 a shot, that is their business. The taxpayers are still paying. I don't know what that *x* is though.

As I look at your proposal, I have no way of knowing whether I should support it or not under any other reasons but national secuirty. That is a separate set of issues.

The issues that we are trying to find out here today are what is the relative cost of both, and what is the most cost-effective way of doing it?

I tell you, Mr. Secretary, with all respect, nothing I have heard this morning has shed any light on that, and I intend to find out the answers to these issues.

Senator **Andrews**. I applaud my colleague for doing this. I would hope with the information I have just asked for provided the committee and the information my colleague has asked for and either in a public or private meeting, we can get to the bottom of it because it is extemely important to the taxpayers and also the defense posture of the country.

I salute my friend.

Mr. **Aldridge** We absolutely agree. The purpose of this program is essentially to make absolutely sure we can get these very important payloads to orbit because they are essential for maintaining the national security of the country.

That is the purpose. We would pay whatever it took to get that job done. Unfortunately, the argument starting to go around is what is the cost effectiveness of this option versus that option?

Unfortunately I can't answer your question either. The shuttle price runs from $30 million, which is the marginal cost to fly the additional flight, to $250 million if you divide the budget.

I don't know the answer to what it really costs the taxpayer. You will have to ask NASA that. The range is from $30 to $250 million. Of course, the Congressional Budget Office just completed a study showing the range runs from $84 to $150 million, depending on what assumptions you make as to how much of the support base you put into the NASA budget or the shuttle launch budget, or what.

It is a very, very difficult question. It is tough for us to answer. All I can answer is what do they charge you to fly and that is certainly less than what it costs the taxpayer.

Senator **RUDMAN**. That is a parochial interest which you have to have. I don't quarrel with that. But we have to take a broader view. We serve on the subcommittee. We also serve on the Senate Appropriations Committee.

It seems to me that in order to make a thoughful decision we must determine how many of those independent vehicle launches are necessary for national security irrespective of cost. After we make that decision, we can decide how we do the rest of them—calculate the cost of the others—that is what we have to find out.

Before I am willing to cast any votes on this, I want to find out the answers to these issues. I am going to request the Chairman to dig into these things—he digs into things more deeply than I do, and we ought to find out answers to what we are talking about.

Mr. **ALDRIDGE**. The answer to the question, the three payloads are the top priority loads for national security purposes. We pick those ones that are essential that we have no delays in getting them in orbit, proper orbit at the proper time with the highest degree of reliability we can get.

Those are the three we picked for CEV. The remaining launches are those for which we can afford more time, for which man in the loop is required to operate the satellites, and so forth. That is exactly what we have done.

Senator **RUDMAN**. General Kutyna, let me ask a couple of questions. We have a lot of facts here and I am not sure that I understand them all.

SOVIET SPACE ACTIVITY

On the first chart you indicated the relative activity of the Soviet Union and ourselves, in the time period 1977 to 1980-81. Although Soviet capability was still greatly above our capability, both had a very substantial dip at that point.

In about 1978, Soviet capability dipped about the same amount as ours dipped. They both dipped appreciably during that period. Is there any special reason why they both dipped? That seems more than coincidental. I am wracking my brain about various negotiations that were going on.

Whatever happened there, it seems good to me in terms of spending money. I want to find the magic formula that caused that.

Mr. **ALDRIDGE**. I think for 1979-81 I can probably answer for the United States. We were waiting for the shuttle which was late in getting launched. We were waiting for that for some of these launches for the payload.

Senator **RUDMAN**. They waited to see whether or not the shuttle worked?

Mr. **ALDRIDGE**. I can't answer for them, but I can answer for us.

Senator **Rudman**. I just wanted to ask that. Most of these charts don't have relationships. The data looks like hen tracks. But that chart has a real interesting parallel. I may look at that later.

SATELLITE SURVIVABILITY

General, the main question I have is on your testimony. You talked about Milstar. I did not write it down exactly, but I think you said that things were being done with that satellite so that it could exist in a nuclear environment.

General **Kutyna**. Obviously, it will not take a direct nuclear attack, but it will withstand a radiation type of nuclear attack, depending on how far from the satellite. Of course, if it is right next to it, it will not.

Senator **Rudman**. The distance is classified?

General **Kutyna**. Yes, sir.

Senator **Rudman**. Will you supply that for the record?

General **Kutyna**. Yes.

A satellite that is not hardened for nculear effects will not survive. Many of our current satellites will not withstand it.

[The information follows:]

Milstar Survivability

The Milstar satellites are being designed to withstand [deleted] attacks against each satellite by a [deleted] nuclear weapon [deleted].

[Deleted.] In addition to this capability to withstand the prompt radiation effects from a nearby detonation, the Milstar satellites will be hardened to withstand the longer term enhanced radiation effects caused by nuclear detonations occurring anywhere in space.

SATELLITE HARDENING

Senator **Rudman**. In our own SDI Program we are doing a number of things. We are also working at ASAT which is another defense initiative.

Are we looking at substantial hardening of some of these satellites that will greatly increase their weight?

For instance, harden them against kinetic energy attack?

General **Kutyna**. I don't think you will see hardening against kinetic energy attacks. I think you will see other measures taken, the same thing you do with aircraft.

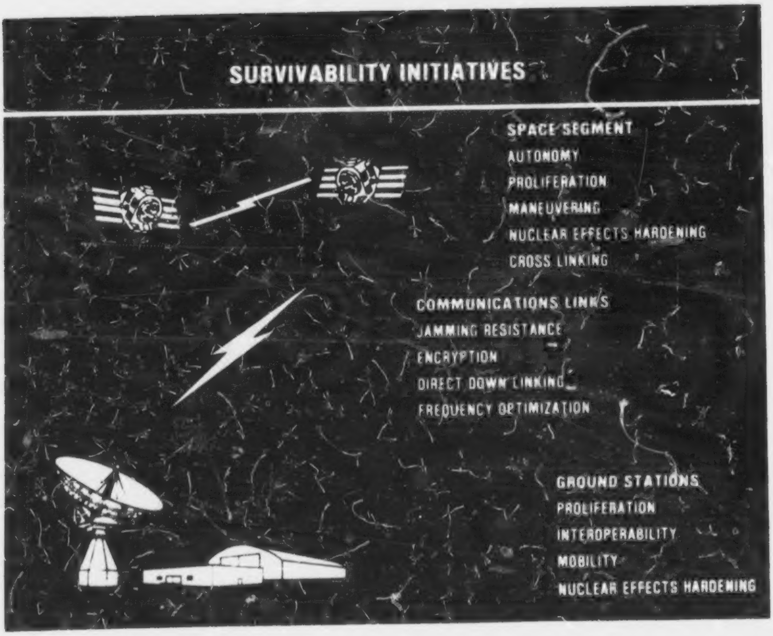
[Deleted.] You might mask yourself with ECM, electronic countermeasures.

Senator **Rudman**. You have anticipated my next two questions. My next two questions concerned these satellites that I am aware of.

You spend billions of dollars. Obviously, a preemptive strike launched by an aggressor has part A and part B. Part A takes out the satellites and part B the launch.

What are we doing about that?

Answer for the record if you wish.



SURVIVABILITY INITIATIVES

SPACE SEGMENT
- AUTONOMY
- PROLIFERATION
- MANEUVERING
- NUCLEAR EFFECTS HARDENING
- CROSS LINKING

COMMUNICATIONS LINKS
- JAMMING RESISTANCE
- ENCRYPTION
- DIRECT DOWN LINKING
- FREQUENCY OPTIMIZATION

GROUND STATIONS
- PROLIFERATION
- INTEROPERABILITY
- MOBILITY
- NUCLEAR EFFECTS HARDENING

SLIDE 53

SURVIVABILITY COSTS

General KUTYNA. I think for the hearing I can say we are spending a considerable amount of money in the area of survivability. Here are some of the things we might be doing for survivability; and satellite survivability is not the only thing you have to worry about.

You have to worry about the communication links between the ground and the satellite and, of course, the ground stations. On this chart you can see some of those things that we are looking at to increase the survivability of the entire system.

[The information follows:]

SATELLITE SURVIVABILITY

The Air Force has undertaken several major efforts to critically examine and improve the survivability of our current and projected satellite systems in the context of an increasing threat environment.

First, we have developed a Space Systems Architecture in which survivability is a major consideration. We have compiled current and future requirements submitted by the operational commands, and have evaluated how well our space and ground systems meet the requirement in a series of increasingly hostile environments. We have identified the gaps between what is required and what we can actually do.

We are developing alternatives for redressing the operational deficiencies and selecting the alternative which can close the gaps in the most timely and cost-effective way practical. The Space Systems Architecture outlines our investment strategy for space systems through the turn of the century.

Second, the Air Force has major technology programs which address a wide range of survivability measures such as survivable telemetry, tracking, and commanding systems; countermeasures against current and projected antisatellite systems; higher frequency data and command links; satellite autonomy; and many others.

Third, the Air Force Program Offices are working to enhance the survivability of our space systems in a logical sequence. Survivability can be implemented most cost effectively at the beginning of a program, that is, if it is designed in from the start. Major changes to existing satellites can only be done during block changes. The following is a brief overview of the threats and what we are doing in the Program Offices to protect our assets.

US space systems face a number of threats. We will discuss the threats with respect to (1) satellites, (2) data and command links, and (3) ground stations and launch facilities.

Threats to the satellite include: (1) the Soviet coorbital conventional antisatellite (which has been operational since 1971); (2) collateral damage from nuclear devices; (3) ground-based lasers (which are currently a threat to sensors); (4) and space lasers which are not expected to be a threat until the (deleted).

Threats to the data and command links include: (1) spoofing, that is, sending erroneous data to the satellite or ground stations; (2) ELINT, for determining order of battle information; (3) jamming of the uplink from ground stations to satellites; (4) jamming of the downlink from satellites to ground stations; and (5) blackout and scintillation caused by nuclear weapon effects. All of these threats can currently put our satellite systems at risk.

Threats to the ground stations and launch facilities are (1) sabotage, (2) conventional weapons, (3) collateral nuclear damage, and (4) high altitude electromagnetic pulse (HEMP).

We will review the survivability enhancements currently employed or planned for several of our satellite systems including Milstar, GPS, DSP, DMSP, and DSCS and for our launch capability.

Milstar: The planned orbital configuration for Milstar is beyond the attack envelope of the current Soviet coorbital ASAT. [Deleted.] The various components of the satellite, and the satellite taken as a system, are hardened against prompt and delayed nuclear effects which would result from a nuclear weapon burst.

The satellite is hardened also against laser radiation [deleted].

The data and command links are encrypted end-to-end to avoid spoofing or loss of security to Soviet electronic intelligence gathering. the uplinks and downlinks are protected against jamming through the use of beam hopping antennas, frequency hopping of the signal, and satellite on-board processing. Mitigation against the effects of scintillation and blackout is provided by using extremely high frequency (EHF), and advanced signal structure (coding, interleaving).

Ground stations will be widely dispersed and proliferated. command ground stations will be located on highly survivable platforms [deleted]. Ground stations will have a combination of hardening and shielding to protect against HEMP.

Navstar Global Positioning System (GPS): Navstar GPS is a highly survivable, space-based radio navigation system. GPS is not an all or nothing system. Today, six R&D satellites provide from four to six hours per day of coverage to most of the world at completely predictable times. The number of hours per day covered will grow until we achieve full operational capability in 1988.

Then, antisatellites attacking the space segment will have to cope with 18 satellites plus 3 spares at 11,000 miles in six separate planes. This is beyond the current capability of the Soviet coorbital ASAT. If the Soviets develop an ASAT capability against GPS, this constellation configuration would force the Soviets to use one antisatellite to kill each GPS satellite.

Until all spare satellites were destroyed, there would be no impact on worldwide GPS coverage. Subsequently, there would be minor reductions in the number of hours per day of coverage for each satellite destroyed. To be effective, the attack would require weeks before the GPS constellation was degraded sufficiently to preclude operational support.

Since the constellation is so large, jamming is a significant problem for any adversary. To effectively jam the uplink, jammers would have to continuously radiate every GPS satellite for two weeks. Such a feat can only be accomplished with a system of large ground jammers on territory outside the Soviet Union. This type of jamming threat does not exist.

Downlink jamming can only be effective against individual GPS users. This is a low probability threat, because military users have backup self-contained navigation systems or easy terrain masking techniques if the GPS signal is temporarily lost.

Further, the spread spectrum signal and null steering antenna to be employed on most user platforms will provide additional jamming protection.

GPS ground control is accomplished with a geographically dispersed network for coverage and survivability. The network consists of a Master Control Station in the CONUS, three Ground Antennas for Telemetry, Tracking & Control (TT&C) and navigation uploads (Diego Garcia, Ascension, Kwajalein), and five passive Monitor Stations to determine navigation correction information (Diego Garcia, Ascension, Kwajalein, Hawaii, and CSOC).

Remote Tracking Stations in the Satellite Control Network will also be able to back up the GPS Ground Antennas in an emergency. For GPS mission support to survive, only one of each element of the ground network must survive.

Defense Support Program (DSP): They DSP satellites are in geosynchronous orbit and therefore beyond the current capability of the Soviet coorbital ASAT. The could be attacked by launching the coorbital ASAT on a larger booster, a capability not tested by the Soviets to date. To add some measure of proliferation, satellites which have been replaced are kept in a standby mode to utilize residual capability in a backup mode.

The satellite is hardened against collateral nuclear damage and ha
upset recovery (electronic circuits are automatically reset after a nu
[Deleted.]

Ground stations are protected against high altitude electromagnetic pulse (HEMP). Mobile ground terminals will provide survivability through proliferation and location uncertainty. Satellites beginning with number 14 will have crosslinks which will reduce the dependence on vulnerable overseas ground stations. [Deleted.]

Finally, improvements in the ground control network will improve communication survivability.

Defense Meterological Satellite Program (DMSP): There are three types of DMSP satellites to consider: 1) Block 5D-2 (Flights 6-14) flown on Atlas E; 2) Block 5D-3 (Flights 15-20) intended to be compatible with Titan II, and 3) DMSP II, (Flights 21 +) a satellite designated to be survivible in the trans and post nuclear attack environments.

Block 5D-2 and 5D-3 satellites are vulnerable to the operational Soviet coorbital ASAT and will remain so, as there are no plans to add maneuvering or self-defense capability. DMSP II is planned to have maneuvering capability. Block 5D-2 satellites are partially hardened against total dose effects resulting from nuclear bursts. Block 5D-3 satellites will be designed to have some hardening against both prompt and total dose effects.

Block 5D-2 satellites have no hardening against laser radiation currently; [deleted].

Block 5D-2 satellites currently have no protection against spoofing or electronic intelligence gathering on the command and control links. The data links are all encrypted. Beginning with Flight 9, the command and control will be encrypted and authenticated.

The uplinks and downlinks are presently vulnerable to jamming. There is some protection for the strategic mission due to dispersion of ground stations. Two stations, located inland on oposite coasts in the U.S., are used for command and control and data receipt and relay. In addition, there is access to the Hawaiian Tracking Station for data receipt and relay. The tactical mission is only impacted locally where the downlink could be subjected to jamming.

The data and command links would be adversely affected by scintillation and blackout. Planning has begun for using EHF frequencies and advanced signal processing in DMSP II, in addition to the necessary S-Band, to correct the deficiency.

The ground stations are protection against sabotage. The command and control stations would be vulnerable to conventional weapon attacks, but are located inland in the U.S. Planning is in progress for increasing the autonomy of the satellites. The stations are vulnerable to collateral nuclear damage, except for the Fairchild Satellite Operations Center which will be hardened against collateral damage. The ground stations are vulnerable to HEMP.

Defense Satellite Communications System (DSCS): The DSCS is transitioning over the next several years to a Phase III satellite constellation. The DSCS III satellites are geosynchronous and therefore outside the attack envelope of the Soviet coorbital ASAT. It could be within the range of the postulated future conventional ASAT threat. The Soviets have not tested this system. DSCS III is fully hardened against nuclear radiation effects.

Both the telemetry and command links are encrypted for protection against spoofing and ELINT gathering attempts. Command and control links, and the communications links are protected against jamming. The satellite has multibeam antennas which can "null out" a jammer. The jammer locator electronics on the satellite provide detection and location [deleted] to permit rapid nulling.

DSCS III operates at super high frequency (SHF) and, thus, is resistant to blackout and scintillation [deleted] following a nuclear exoatmospheric burst.

DSCS III will have primary payload control and backup satellite control capability (from the Satellite Control Facility) in its Satellite Configuration Control Elements (SCCE). Thus, the overall system is resistant to sabotage and limited attacks with conventional weapons. The control elements are also hardened against HEMP and collateral nuclear effects. User terminals are highly dispersed and proliferated. The satellite can also remain stable autonomously for extended periods without ground control.

Launch Capability: In addressing launch survivability, that is, the capability to reconstitute our space assets, we must realize that the launch process is extremely involved and is composed of many unique and single string nodes. Only the Eastern and Western launch sites are available and only a limited number of shuttle orbiters, expendable launch vehicles and facilities exist. Some flexibility for launch in crisis situations is now being incorporated. In cases where it may not be advisable to launch a manned shuttle, the Complementary Expendable Launch vehicle will provide a means of launching our most critical space assets. Our future direction for launch vehicles is being addressed jointly with NASA and survivable launch vehicles is one significant area under study.

C^3 FUNCTIONS IN SPACE

Senator RUDMAN. General, we have a vote coming up shortly. I observe all of the things that have caused us to want to move these C^3 functions into space because of the vulnerability of the ground-based assets to a variety of means make them ineffective.

I have to assume Soviet technology is not that far behind our own. It concerns me when we spend all this money, and are unsure whether it will work or not. That is a very huge concern.

That is not the reason I am doing it, but it is a very reasonable concern. Thank you.

Senator STEVENS. Let us go back to where I was when I yielded.

REPROGRAMMING COMMITMENT

I would like to know on reprogramming what is the extent of the Government's commitment if we approve that $30 million reprogramming?

Are we starting a new program?

I have CBO's comparison of incremenal cost. You mentioned $2.1 billion. Am I approving the $2.1 billion program?

Mr. ALDRIDGE. No, sir, each year the budget has the funds in it to complete the program. There is $339 million in fiscal year 1986 that is also before the committee.

Senator STEVENS. You are not making a commitment that will yield to the whole program obligation in any way?

Mr. ALDRIDGE. No, sir. Obviously, you would have oversight for that.

Senator STEVENS. In answer to Senator Rudman, we don't know yet whether we have objections or not, but it appears we have enough concern over these figures that we ought to have a hearing and I will be willing to have one tomorrow.

We can clear out the schedule and have one tomorrow at 10 o'clock if we can get you and NASA here to join in answering the questions.

I have an idea from what I hear, I am trying to see around corners, we probably are not going to poll this out until we get some answers to these questions that have been expressed to me privately and you have heard this morning.

We will do our best to set a hearing tomorrow and urge your cooperation. If we can't do it in the morning, we will have to do it in the afternoon. I think the morning would be the best time since we may not be able to hold it in the afternoon because of problems on the floor.

ASAT TEST SCHEDULE

I am told in terms of the antisatellite schedule, there have been some technical problems. I don't want to go into the classified portion of it, but it is my understanding that the first test will be well beyond the date we put in last year's continuing resolution.

There was some indication here that you think that you can still meet that date. Am I wrong?

Mr. **Aldridge**. I believe the rumors you hear are correct. We have had some technical problems with the ASAT vehicle and we are trying to resolve those to assure when we do test, it will be successful.

I believe last year we were planning in the springtime for that test and now it looks like it will be in the midsummer timeframe.

Senator **Stevens**. I understand we are going to face another battle over a moratorium on ASAT testing?

Mr. **Aldridge**. Yes, sir.

Senator **Stevens**. That is one I have been trying to keep up with in Geneva. My judgment is that that would be a serious mistake in view of the Soviets own existing capability already.

ASAT PROGRAM ISSUES

You have a 1986 request here and the indications we have are that you will only get two antisatellite miniature vehicles rather than the three we were talking about last year.

Mr. **Aldridge**. There are two different issues. One is the test program and the other one is the production program.

We have submitted in the President's budget the request for the production of three miniature homing vehicles in 1986. It looks like now, based on the technical difficulties we have had with the program, we can only afford to buy two of those rather than three.

Senator **Stevens**. It is cost constraint rather than program constraint?

Mr. **Aldridge**. It is program, it is having some technical difficulties which have caused us to stretch out the program to make sure those problems are solved. When we do that, the unit cost of the program begins to rise which means we could not afford the three of them.

Senator **Stevens**. How much is actually needed for 1986 then for the two missiles?

Mr. **Aldridge**. The same dollars we requested for 1986 for the three missiles.

Senator **Stevens**. Then you are sort of rescheduling your funds as compared to your original justification.

Will you give us something for the record so that we will understand that, please?

Mr. **Aldridge**. Yes, sir.

[The information follows:]

ASAT FY 86 REQUIREMENT

Two events have caused us to reassess the quantity of missiles we can buy in FY 86. First, Congress cut our FY 85 request for advance procurement in half, decreasing the number of missiles we can buy in FY 86. Second, the contractors submitted their proposals for production of missiles for lots 1 and 2 (FY 85 and FY 86) and the costs were much greater than the Air Force had estimated. We have gone through an extensive review and required the contractors to justify their costs. Even after eliminating some parts of their proposals and driving down in others, the funding required exceeds our budget estimates. We are still working this problem but do not see any contractual approach which will provide us with more than two missiles in FY 86, given the level in the FY 86 request.

IUS VS CENTAUR

Senator **Stevens**. Can you tell me why the Air Force decided to transition from the inertial upper stage to Centaur for the Milstar satellite?

Mr. **Aldridge**. Yes, sir.

Senator **Stevens**. Are there cost control problems there that we don't know of?

Mr. **Aldridge**. They were basically the estimates of the weight of the Milstar satellite. We are up against the performance limits of the IUS upper stage. We had to take two approaches.

One of them is to go ahead and try to squeeze the weight out of the Milstar satellite to make it fit the upper stage performance which is extremely expensive when engineers start taking out ounces of weight necessary to make that performance need, or at roughly the same cost, as a matter of fact, a little bit less, we can provide an upper stage that is capable of lifting more weight than the Milstar satellite and not have to go through that design pain of having to shave weight out of the Milstar satellite.

Senator **Stevens**. I understand in 1987 you will start procuring a Centaur G; is that right?

Mr. **Aldridge**. Yes, sir. That is the joint program we have with NASA where the DOD and NASA have joined up where NASA would build what is called the G prime which is the stretched version of the Centaur and we would use a shortened version of the Centaur called Centaur G.

Senator **Stevens**. Why can't you use the stages that are being developed by the private sector?

Mr. **Aldridge**. They will not meet the schedule, what we are predicting at this particular point. They are still paper design upper stages. They are not flight proven hardware.

Senator **Stevens**. The fact that you are making this decision will mean they will never be flight proven hardware; is that correct?

Mr. **Aldridge**. No, sir. At the time that we made the decision on IUS and Centaur there was no other option available to us for competition.

Senator **Stevens**. You are sole source now only with Centaur G?

Mr. **Aldridge**. No, sir. What I have instructed the Space Division to do is that we have now designed the satellites with their upper stages. They are fully compatible, they are tested, they are designed to be consistent.

If in the future we go through a block change of a satellite, I have instructed the Space Division to go completely competitive at that particular time when the new design can be designed into the satellite itself rather than having to pay the integration cost.

What we have instructed them to do is look at Centaur IUS' new upper stages as well as internal propulsion, but to do it at a time when we make a block change to the satellite where those design parameters can be inserted in the satellite rather than going back and having us pay the price to do it after the design has been completed.

Senator Stevens. We may want to explore that further.

I have two other questions.

MILSTAR

What really is your requirement for Milstar?

Mr. Aldridge. The requirement is for a survivable strategic, man-controlled communications system. We have no satellite which is designed to be survivable in a crisis environment in space. That is the design that we are planning for Milstar.

Senator Steven. You have a combination here. You can declassify this for the first year now. You are buying three block I R&D satellites, seven block II production satellites. Your acquisition spreads development over two block designs and the first five satellites.

That is a complicated strategy for a new system. We only see that much of it. We only see the first year.

Mr. Aldridge. I believe we have given you all the information for the total program. The plan when we put the Milstar plan together was that when the proposals came from the contractors for the Milstar satellite, to meet all the user requirements, it was far too complicated and far too risky a Program to proceed with the full-up Milstar program in the first few satellites.

So, our acquisition strategy was to descope the first three satellites and to proceed with a less ambitious program and then worry about getting the improvement at a block change, essentially a preplanned product improvement program, that we would not put all that risk on the first satellite with the cost uncertainty that went along with it.

Senator Stevens. Will you let us know if we can get together tomorrow?

We may be able to pursue some of the other questions after we talk to NASA tomorrow. With the number of people we have here, I think it will be a couple hours' hearing at least.

PROGRAM GROWTH

I am really concerned over the out-year expansion of the growth in your program and knowing what we now know about budgets and the way they are going to be restricted, the budget you have just described is the one based on the original projection to us, the budget that was sent up in January, is it not?

None of these has been reduced by NASA agreements coming down to 3 percent or, obviously, by what is happening on the floor now?

Mr. **Aldridge**. No, sir, they have not.

Senator **Stevens**. We have to spend some time not only looking at the first year, but looking at the out-year projections because that growth, obviously, if we are starting off with a base of 1½ percent, or something, even if you put 3 percent on top of that, you don't come anywhere near that three and three.

Mr. **Aldridge**. Yes, sir. The satellites we are talking about for launching are obviously the top priority satellites we have. We would not propose any cuts in those satellites at any budget level. Those are essential.

Senator **Stevens**. That makes an awful deep cut in other areas. That is what we have to look at with you. I hope you can let us know about tomorrow.

Mr. **Aldridge**. We will meet at your convenience.

SUBMITTED QUESTIONS

Senator **Stevens**. The committee has a number of submitted questions which we will ask you to answer for the record.

[The following questions were not asked at the hearing but were submitted to the Department for response subsequent to the hearing:]

Additional Committee Questions

NAVSTAR GPS

QUESTION: How is acceptance defined? Is it at the factory, launch pad, mated with PAM-D or on-orbit?

ANSWER: Acceptance of the GPS satellite is performed incrementally at two points: at the factory, after completion of subsystem integration; and at liftoff from Cape Kennedy.

NAVSTAR GPS LAUNCH SUPPORT

QUESTION: What services are provided by whom with "Launch Support" funds?

ANSWER: The $6.4 million of "Launch Support" funds identified in the Navstar GPS Missile Procurement P-series documentation provide the following services:

a. Pre-launch processing and testing of the satellite at Cape Canaveral.

b. Count-down and launch support for the satellite.

c. Sustaining engineering support.

d. Operation of the Navstar Processing Facility at Cape Canaveral.

This "Launch Support" will be performed by the satellite contractor, Rockwell International, Seal Beach, CA. It is a $39 million negotiated contract line item in the $1.4 billion 28 satellite multi-year procurement approved by Congress in FY 82.

NAVSTAR GPS GFE/GOV'T SPT"

QUESTION: Why has the FY 86 requirement for "GFE/Gov't Spt " gone up $9.5 million since last year?

ANSWER: The $9.5 million increase supports the following critical government activities which are not part of the 28 satellite multi-year contract: Aerospace Corporation sustaining engineering, Eastern Space & Missile Center launch support, NASA services, and support for the Navstar Processing Facility at Cape Canaveral. The latter three items are up from their FY 85 levels in preparation for the first shuttle launch of a Navstar GPS satellite in the first quarter of Fiscal Year 1987. In addition, several items are funded under the GFE category to maintain low risk in the current and future satellite buys. These include development of a second source for atomic clocks and the conversion of the current satellite orbit insertion motor from a carbon-carbon exit nozzle to a carbonphenolic exit nozzle to improve reliability.

INERTIAL UPPER STAGE (IUS)

QUESTION: How much does it cost to store and maintain an IUS per year? Where and how is this cost funded?

ANSWER: Pre-launch storage and maintenance of IUS vehicles costs the Air Force approximately $250,000 per year. These costs are for the storage facility itself and are essentially independent of the number of vehicles being stored. Storage costs are paid with Operations and Maintenance funds budgeted in the Space Launch Support program (PE 35171F).

IUS's SCHEDULED FOR DELIVERY

QUESTION: How many of the three FY 83 and prior year IUS's scheduled for delivery have been accepted?

ANSWER: A total of 14 IUS vehicles have been procured with FY 1983 and prior year funds. Of these 14 vehicles, the Air Force has accepted 11 (as of May 1985).

FY 86 PROCUREMENT OF IUS'S

QUESTION: Since the three IUS's proposed for FY 86 procurement won't be flown until FY 89-91, why can't this procurement be spread over two or three years?

ANSWER: The three IUS vehicles requested in the 1986 President's Budget are required to fly the remaining spacecraft of present design configurations. To meet a 1989 launch date, at least one of these IUS vehicles must be procured in FY 1986. Our procurement plan minimizes the cost of the three vehicles by procuring all of them at one time. Procurement delays of the last two vehicles will increase the program cost by as much as $20 million per vehicle. This cost increase would result from keeping the contractor's and vendors' manufacturing and engineering support personnel on contract for additional years, even though the number of deliverable vehicles would remain unchanged.

IUS HARDWARE SUPPORT

QUESTION: Describe the "Hardware Support" to be provided for the $65.5 million requested. Why is it 80 percent higher than last year and 30 times higher than last year's FY 86 estimate?

ANSWER: The Air Force historically requests IUS Missile Procurement funds in two categories: "Vehicles" and "Hardware Support". The funds requested for "Vehicles" are for the recurring costs of new IUS flight vehicles. The funds requested for "Hardware Support" are for nonrecurring IUS hardware needs. For example, the one-time "Hardware Support" funds requested for 1986 are for solid rocket motors to be used for the IUS solid rocket shelf life extension project, and for engineering changes to previously delivered IUS vehicles required by ongoing NASA configuration changes to Shuttle Orbiters. Last year's FY 86 "Hardware Support" estimate did not anticipate the requirement for motor shelf life extension. This recently identified requirement was caused by the IUS stand-down during the flight anomaly investigation and resolution efforts. Since each of the items funded in the "Hardware Support" category are one-time procurements, there is no intended year-to-year pattern in the amounts requested.

CENTAUR G UPPER STAGE

QUESTION: Seven Centaurs are scheduled for launch before the first production Centaur G will be delivered in FY 1991.

Where will these seven assets come from?

ANSWER: The seven Centaurs to be launched on the Shuttle prior to delivery of the first production Centaur include five DoD flights funded from the RDT&E appropriation and two NASA planetary missions funded by NASA. Since the five DoD payloads [deleted] are funded with RDT&E, so are their Centaur upper stages.

FY 87 BUY OF CENTAURS

QUESTION: If two or more of the Centaur missions are converted to IUS, as is being considered, can the FY 87 buy of Centaurs be reduced by two?

ANSWER: Probably not. The ten Centaur buy associated with the CELV fixed price contract will be adjusted to provide IUSs for three of the payloads. This may be necessary to stay within the CELV budget profile by compensating for higher than anticipated Centaur development costs early in the program. The three payloads which have been selected to fly on CELV/IUS were previously programmed for Shuttle/IUS and would require little or no integration. There are several Shuttle payloads which plan to use the Centaur, but have not yet contracted for Centaur upper stages. The three Centaurs not used on the CELV would be transferred to these Shuttle payloads.

PAYLOAD ASSIST MODULE-DELTA (PAM-D)

QUESTION: What were the negotiated recurring unit hardware costs for FY 1984 through FY 1987 under the multiyear? Does the contract have an EPA clause? If so, describe it.

ANSWER: The negotiated hardware prices for PAM-D II units are as shown below. The decreasing schedule of prices to be paid for each unit reflects expected learning curve efficiencies and the early amortization of nonrecurring production costs such as tooling.

UNITS	UNIT PRICE
1 through 4	$7.425 million
5 through 8	6.025 million
9 through 10	5.025 million
11 through 16	4.125 million
17 through 28	3.325 million

The hardware is procured on a firm fixed price multi-year contract with no Escalation Pricing Adjustment (EPA) clause.

COST OF NINE FY 86 PAM-Ds

QUESTION: Why have the costs of the nine FY 86 PAM-Ds gone up nearly 12 percent over last year's estimate for FY 1986?

ANSWER: The FY 1985 President's Budget was submitted several months prior to the PAM-D II production contract and was based on the best funding estimates available at that time. The multi-year contract was subsequently negotiated and awarded in October 1984. The negotiated amount of total contract costs remained within the amounts previously estimated by the Air Force, but the yearly funding profile was increased in the initial years with offsetting decreases in the outyears. The FY 1986 President's Budget reflects the negotiated funding profile including the resultant $4.2 million increase for FY 1986.

DELIVERIES/LOSSES OF PAM-Ds

QUESTION: For each space launch vehicle for the period FY 84 - FY 92 provide the number of units at the beginning of the year, deliveries from production and losses to space launch.

ANSWER: The Air Force has planned delivery of PAM-D II upper stages to coincide with programmed launch dates. There will be a six-to-eight week launch site processing period between upper stage delivery and actual launch. Future fluctuations in NASA's detailed manifesting of Shuttle flights may cause minor variations to the planned launch schedule.

FISCAL YEAR	YEARLY BEGINNING INVENTORY	DELIVERIES FROM PRODUCTION	LOSSES DUE TO LAUNCH	YEARLY ENDING INVENTORY
1984	0	0	0	0
1985	0	0	0	0
1986	0	+ 1	- 1	0
1987	0	+ 8	- 8	0
1988	0	+ 8	- 8	0
1989	0	+10	-10	0
1990	0	+ 1	- 1	0
1991	0	+ 4	- 4	0
1992	0	+ 4	- 4	0

VAFB SPARES

QUESTION: What things are to be bought with the $24 million for "VAFB Spares"? How much of the FY 85 money has been obligated?

ANSWER: The $24 million is allocated as follows:

$600,000	-	Reimbursement to NASA for upgrades to the Vandenberg Launch Processing System.
$100,000	-	Reimbursement to NASA for logistics support.
$9.0 million	-	Repair, replacement and modification of equipment as a result of the first launch (request is based on costs incurred at Kennedy Space Center following the first launch).
$14.3 million	-	Equipment spares and modifications to launch site equipment (request is derived from Kennedy Space Center experience).

As of 10 May 1985, $18.5 million of FY 85 VAFB spares Space Launch Support (SLS) program missile procurement appropriation had been obligated.

DMSP LAUNCH VEHICLE

QUESTION: In FY 85, $22.6 million was budgeted and appropriated for modification of Atlas boosters. That FY 85 work is now budgeted to be done for only $8.5 million. How are these savings being achieved and why shouldn't they be achievable in FY 86?

ANSWER: FY 1985 booster funding requirements in the Defense Meteorological Satellite Program (DMSP) missile procurement line have decreased for two reasons. While we originally planned to fund all remaining Atlas refurbishment for DMSP in FY 1985 and 1986, we now plan to extend this effort into 1987. This will allow a more efficient refurbishment program supporting current launch requirements. Further, FY 1985 savings were achieved because a projected production gap did not occur. Consequently, component redesign and contractor requalification was not necessary making current estimates of negotiated costs less than previously estimated. These booster modifications cannot slip further and support required launches, therefore the revised profile represents a valid plan.

MODIFICATION COSTS FOR THE ATLAS BOOSTERS

QUESTION: For each of the last DMSP launches, what were the modification costs for the Atlas boosters used and what years were those modifications funded?

ANSWER: There have only been two DMSP spacecraft launched by Atlas boosters. Atlas modification costs were as follows:

ATLAS REFURBISHMENT

LAUNCH	COST ($ MILLION)	YEAR
F-6	$5.2	FY 80
F-7	$5.2	FY 81

NUMBER OF MODIFIED LAUNCHABLE ATLAS BOOSTERS

QUESTION: How many fully modified launchable Atlas boosters to support the DMSP program are in storage as of May 1, 1985?

ANSWER: There is one fully refurbished Atlas E booster dedicated to the Defense Meteorological Satellite Program (DMSP) in storage as of 1 May 85. It is assigned to DMSP Block 5D-2 satellite S-8, which will go into storage at Vandenberg AFB, CA, not later than 31 May 85.

QUESTION: How many more will be available as a result of the FY 84 and FY 85 programs?

ANSWER: The refurbishment of three additional Atlas E launch vehicles is funded through FY 85. These will support Block 5D-2 satellites S-9 through S-11. Their delivery schedule allows necessary launch base processing to meet projected satellite launch requirements.

MISSION SENSOR FUNDS

QUESTION: If the satellites are fully funded at time of contracts, why are the $18.9 million in mission sensor funds needed in FY 86? What are these mission sensors going to be used for?

ANSWER: The Defense Meteorological Satellite Program (DMSP) fully funds production satellites. The satellite end item is a spacecraft and a primary cloud imaging sensor. Additional meteorological, oceanographic, and solar-geophysical mission sensors are procured and flown as needed to meet military requirements. Since the complement of these mission sensors can vary by satellite, they are individually procured with sufficient lead time to allow for integration during spacecraft production.

The mission sensor funding in FY 1986 provides for the procurement of one microwave imaging sensor for satellite S-14 and two microwave moisture sounding sensors for satellites S-13 and S-14. Data from the microwave imaging sensor will provide information on ocean surface wind speed; ice area coverage, age, and edge location; precipitation; cloud water content; atmospheric liquid water content; and soil moisture. Data from the microwave moisture sounding sensor will provide atmospheric water vapor profiles. This information is important to support a wide range of Air Force, Army, Navy, and Marine Corps military operations. This information is vitally important to support infrared guided weapons and drive numerical computer forecast models.

MILITARY REQUIREMENT FOR IONDS

QUESTION: The Air Force is developing an expensive, nuclear detonation detection sensor for GPS, called IONDS. What is the military requirement for IONDS? Why is there a need for a full nuclear detection sensor system on GPS satellites?

ANSWER: IONDS will fulfill the military requirement for a highly survivable, world-wide, near real-time reporting system which can accurately characterize and locate nuclear detonations. IONDS is required to support a variety of users across the entire conflict spectrum from peace-time through post nuclear war. [Deleted]. The integration of the IONDS sensors on the GPS satellites will provide the most cost effective system that would meet all requirements. Several features of the GPS satellites are essential to make IONDS work. IONDS uses the precise positioning and timing information of GPS to provide extremely accurate location of nuclear detonations. The GPS satellite orbits provide continous world-wide coverage. The 18 satellite constellation provides a high degree of system survivability.

COST SAVINGS BY DELETING IONDS

QUESTION: What would be the cost savings from deleting IONDS from GPS satellites?

ANSWER: The IONDS payload, rather than being a discrete addition to the GPS satellite, is integrated into almost all the satellite subsystems including power generation, telemetry, radio frequency processing and navigation data processing. Thus, a major redesign of the GPS satellite would be required to delete IONDS. We estimate that the schedule delays and resulting cost increases to the GPS program resulting from major changes to the GPS multiyear contract would far exceed any projected IONDS cancellation cost savings.

CAPABILITY LOSS BY DELETING IONDS

QUESTION: What would be the loss in capability? Could

AILABLE

that loss be alleviated through the use of other national technical means of verification of nuclear detonations?

ANSWER: Without IONDS, we have no capability for a highly survivable, world-wide, near real-time reporting system which can very accurately characterize and locate nuclear detonations. IONDS supports many users across the entire conflict spectrum from peacetime through post nuclear war. National technical means contribute to the nuclear detonation verification process, but have significant shortcomings and therefore cannot be substituted for IONDS. These systems do not provide continuous world-wide coverage. As a result, we could miss events or provide delayed, ambiguous reports. Without IONDS, we will not have the 24 hour a day, world-wide capability to precisely locate nuclear detonations in support of recovery operations, reconstitution of both military and civilian forces, restrike targeting, and attack assessment. Loss of IONDS will severely reduce our capability to monitor compliance with the Limited Test Ban Treaty.

DSCS (DEFENSE SATELLITE COMMUNICATIONS SYSTEM)

QUESTION: The Air Force is requesting $149.2 million for procurement of 2 DSCS III satellites. Following the conclusion of the multi-year contract in FY 1988, you will buy three more DSCS III satellites. You are requesting $6.9 million for R&D in FY 1986 to start design changes for these satellites. What is the requirement for partial redesign of DSCS III? What will this mean for the unit cost of these satellites? How much of the cost will be driven by redesign of the upper stage?

ANSWER: The need to start a study in FY 1986 for the redesign of DSCS III satellites acquired after the current multiyear procurement (MYP) ends in FY 1988 is based on several considerations:

(a) recognition that some parts will either be obsolete or unavailable;
(b) recognition that more economical upper stage systems will probably be available;
(c) recognition that both communications capacity requirements and the jamming threat are likely to increase.

All but one of the post-MYP satellites will be acquired in the last decade of this century. Specific changes for these satellites have not been identified; however, changes will be required because of parts obsolescence and unavailability. This will most likely affect the attitude control electronics although all electronic subsystems may be impacted. Changes may also be required to interface the satellite with a new upper stage. The Air Force will explore competing upper stage systems in this expanding market area to reduce overall system cost. Approximately half the FY 1986 RDT&E request is for these post-MYP studies while the rest is to sustain system program office operations and to pay on-orbit performance incentives. Because the studies to define required changes for post-MYP satellites have not been conducted, cost estimates are not available. The FY 1986 request does not contain funding for hardware development of changes for these satellites. The FY 1987 request may contain development funding for the post-MYP satellites, depending on the results of forthcoming studies and analyses.

DEFENSE SUPPORT PROGRAM COST GROWTH

QUESTION: Your R&D budget request for DSP is way up--at $79.6 million it is some $30 million more than last year's projection for FY 1986. Your descriptive summary states that these cost increases are for "software development associated with satellite upgrades, Mobile Ground Terminal Test Support and space-related launch charges."

Explain for the record the reasons for this large cost growth in DSP R&D funding requirements.

ANSWER: The $29.7 million increase over last year's projection represents increases in three areas: Software development ($15.3 million), Mobile Ground Terminal development ($7.3 million), and spacecraft-related launch costs ($7.1 million).

$12.3 million of the software development increase is for ground-station software modifications that add to capability. This includes second color processing, automatic ephemeris generation, and satellite command and status update. The additional $3.0 million is necessary because original estimates for computer support at the software development facility were too low.

The $7.3 million for the Mobile Ground Terminal is for additional development required for the survivable commanding and data readout links associated with the more survivable DSP-I satellites.

The increase in spacecraft-related launch costs include $5 million for the first time integration with the Space Shuttle. An additional $2.1 million is to revise the software on-board the satellite to accommodate finalized performance and configuration.

PURCHASE OF ADDITIONAL DSP SATELLITES

QUESTION: Is the Air Force looking at buying additional DSP satellites beyond those in the current five-year defense program?

ANSWER: Yes. The current five-year defense program funds three spacecraft, and advance procurement in FY 1990 to support the procurement of a fourth satellite in FY 1991. In order to maintain the operational constellation, approximately one DSP satellite must be launched per year. The Air Force plans to continue buying satellites to maintain this launch rate until the DSP system is replaced [deleted].

AVERAGE ORBIT LIFE FOR DSP

QUESTION: Is the current average orbit life for DSP beyond its specified minimum design life?

ANSWER: Yes. [Deleted].

STATUS OF THE LASER CROSS-LINK PROGRAM

QUESTION: Describe the current status of the laser cross-link program for DSP satellites.

ANSWER: The DSP laser cross-link program has cleared all technological difficulties. The cross-links have been in production since April 1984. The FY 1982-1983 development problems did delay the program to the point where we can no longer install a laser cross-link on satellite 14, if satellite 14 is launched as scheduled [deleted]. Retrofit may be possible if the launch date is delayed. Cross-links will be installed on satellites 15 and beyond.

CONSOLIDATED SPACE OPERATIONS CENTER (CSOC)

QUESTION: Last year's budget revisions reduced R&D and O&M funding for the Shuttle Operations and Planning Complex (SOPC) portion of Consolidated Space Operations Center. This reduction had the net impact of extending DoD's continued reliance on the Johnson Space Center for another two years.

Do you intend to prevent further slippage in the SOPC portion of CSOC?

ANSWER: Our force structure planning process provides recommendations for expenditure of our limited budget and sometimes results in program delays. SOPC, like all other DoD programs, will be reviewed as a part of our budgetary process. Any decision to affect planned SOPC development will receive an extensive and sensitive review prior to submittal of any program change.

SLIPPAGE OF SHUTTLE OPERATIONS AND PLANNING COMPLEX (SOPC)

QUESTION: Would continued reliance on Johnson Space Center as a vulnerable control center without a backup capability present a significant risk to DoD's need for assured access to space?

Why, if you are so concerned about the need for the CELV for assured access to space, have you allowed the SOPC portion of the CSOC to slip another two years beyond its intended IOC?

ANSWER: There is a risk associated with reliance on Johnson Space Center (JSC) as the sole facility providing Shuttle control and planning. However, alternative means could be generated to accomplish the Shuttle mission should JSC go down for an indefinite period. These would be higher in risk and temporary in nature.

Without the CELV there is no alternative path to space.

DOD MISSIONS AT THE JOHNSON SPACE CENTER

Question: Does prolonged operation of sensitive DOD missions at the Johnson Space Center increase the risk of exposing sensitive DOD aspects of DOD missions?

If so, what are you doing to minimize the risks?

Answer: The DOD currently supports the Shuttle missions using a functional capability called the DOD Controlled Mode. This system has elements at JSC, Goddard Space Flight Center, the Satellite Control Facility, the launch sites and other locations. It is the combination of these elements, the open environment of JSC and the publicity applied to Shuttle that pose risk to sensitive DOD missions. While the military portions of DOD Controlled Mode can support levels higher than SECRET, NASA positions are constrained to SECRET. In spite of this constraint, work around procedures to operate within this environment have been established. We are currently reviewing the security lessons learned from the first dedicated DOD Shuttle flight. Appropriate security changes will be made based on this review.

REPROGRAMMING FOR SOPC

QUESTION: Last year in our report, the Committee expressed concern over the slippage of the SOPC portion of CSOC and recommended that the Air Force consider a reprogramming action to prevent the 2-year slip in its IOC.

Does the Air Force intend to submit a reprogramming action this year on the SOPC portion of CSOC?

ANSWER: The Committee's recommendation was given extensive consideration; however, with our current fiscal limitations and priorities, and the ability of Johnson Space Center to support DoD missions for an interim period, we do not plan to reprogram funds for this purpose.

SPACE BIOTECHNOLOGY

QUESTION: You are requesting $700 thousand for the Space Biotechnology project. Your program description indicates that you wish to study man's capability to perform military missions in space. You specifically refer to exploiting the shuttle in evaluating this capability.

How do you really envision this program? Is it to develop a space-based battle management capability for the Air Force? How does it relate to the SDI and ASAT programs? To our military satellite programs?

Just what do you intend to study?

ANSWER: In the President's Budget, Space Biotechnology was structured as Project 2992 in the Crew Systems Technology program (PE 63231F). Space Biotechnology is a natural extension into the space environment of Crew System Technology's advanced technology life support equipment and addresses non-system specific development to provide space human factors design information for manned military space missions. Further, it concentrates on providing human performance data on operational tasks such as space-to-ground visual target acquisition and tracking. Additionally, by agreement with NASA, Space Biotechnology provides transition of advanced technology in the areas of extra-vehicular activity (EVA) equipment, spacecraft habitability, teleoperations and military space medicine.

The Space Biotechnology project is to develop generic technologies to support future Air Force man-in-space applications. The technology program is not oriented to any specific mission application such as a space-based battle management capability.

Since the Space Biotechnology project is generic, it does not directly relate to any specific space application such as the SDI and ASAT programs. There is no relationship between the Space Biotechnology program and the SDI and ASAT programs.

The Space Biotechnology project is to provide technology supporting manned military space operations. This project is not related in any way with our present unmanned satellites.

The program is to follow-up on numerous prior studies that have identified vision as the most likely human attribute of military utility in space. This classically supports earthborne military activities unrelated to SDI. Military Space Biotechnology seeks to exploit the space shuttle to demonstrate manned military capabilities. Since 1983 it has built on Air Force and NASA experiences with astronaut vision to demonstrate the proper mix of field-of-view, magnification and tracking controls for ground target acquisition and identification.

SPACE O&M SUPPORT

QUESTION: Considering the enormous pressure to reduce the defense budget, couldn't certain aspects of space O&M support be deferred or curtailed?

ANSWER: The Air Force Space Support Operation and Maintenance (O&M) budget in Major Force Program III provides consolidated launch and orbital support for operational Department of Defense (DOD) programs. In Fiscal Year 1986, the Air Force has requested $972.2 million, which represents a $223.4 million ($192.9 million real growth not including escalation) increase over the Fiscal Year 1985 request. The increase is due primarily to the initiation of operations at the Consolidated Space Operations Center (CSOC), the transition from development to full operations of the Navstar Global Positioning System (GPS) control segment, and the initiation of launch operations to support two Space Shuttle missions at Vandenberg AFB. The space O&M budget provides launch and on-orbit support of satellites approved and funded by Congress. Deferring or curtailing space O&M support would require that we not launch some of those satellites, such as those scheduled to launch on the Shuttle out of Vandenberg AFB, or that we defer or curtail deployment of the GPS since we would not be able to provide on-orbit control. If we are going to have operational space systems, we must provide the necessary O&M funding to support them.

PROGRAM INCREASE FOR SPACE O&M SUPPORT

QUESTION: The Space O&M support program is budgeted a real program increase of $192.9 million in FY 1986. What would be the effect of zeroing this request increase?

ANSWER: Zeroing the $192.9 million Fiscal Year 1986 real growth for the Space Support O&M program in Major Force Program III would severely impact the following Air Force programs:

a. Consolidated Space Operations Center (CSOC) - CSOC facilities become available for occupancy in October 1985. Zeroing the $62.9 million real growth will preclude us from obtaining the skilled expertise to bring the new system up operationally and to train the initial cadre of Air Force personnel. A four-fold impact to the CSOC, as outlined below, would result.

1. The April 1986 Initial Operational Capability (IOC) for the GPS Master Control Station (MCS) would be delayed a minimum of one year. The interim MCS capability at Vandenberg AFB would require extension causing an FY 1986 impact of $8-10 million to the GPS program. Approximately 120 military personnel in training for the GPS MCS would have to be transferred to other duties for FY 1986.

2. The February 1987 IOC for the first satellite Mission Control Center (MCC) would be delayed a minimum of one year. Associated with the MCC delay would be extensions of on-going acquisition contracts with cost impacts of $6 million in FY 1987 and $36 million in FY 1989.

3. Transfer of operational programs from the Satellite

BEST COP

Control Facility to CSOC would be delayed with cost impacts to the SCF of $10M in FY 1986/1987.

4. Approximately 400 military personnel would have to be transferred to other duties (many could involve PCS moves and therefore additional cost) due to the delays in IOC.

b. Space Launch Support (SLS) - Real growth for the SLS program in FY 1986 is $107.6 million. The largest part of this growth is attributable to the achievement of IOC for Space Shuttle launches from the Vandenberg AFB launch and landing site in October 1985. During FY 1986 two Shuttle launches are scheduled from Vandenberg. Zeroing these funds will delay planned missions and increase costs to the spacecraft programs involved for the first launch. These costs are estimated at $4.5 million per month. Another activity which would be affected by the zeroing of the increase is launch support for the Inertial Upper Stage. Due to the rescheduling of launch activity in FY 1985, the number of IUS launches in FY 1986 has increased. Reduction of these funds would result in an inability to support all the missions scheduled by the DOD mission model. Other activities of the Space Shuttle which could not be funded if the real growth is zeroed are: secure operations for DOD Shuttle missions and payload integration activities.

c. Navstar Global Positioning System (GPS) - The $6.8 million real growth supports the GPS Master Control Station (MCS) that will be located at the CSOC. The MCS is currently in the final stages of development testing and evaluation and will reach IOC by the second quarter of FY 1986. Without the additional O&M, the Air Force cannot support the GPS transition from acquisition to full operations.

PROGRAM INCREASE FOR SPACE O&M SUPPORT

d. Satellite Control Facility - Programmed real growth is required to support a period of dual operations during which satellite programs will transition from the existing operating system to the new Data System Modernization (DSM) system. It also supports O&M for the Transportable Mobile Ground Station (TMGS) which has a September 1985 IOC. Deleting the $11.0 million of real growth would pose severe schedule risk to the DSM program and would delay start of TMGS operations by a year.

e. Space Boosters - The Space Boosters program real growth of $4.5 million is needed to fund Atlas E programmed launches at Vandenberg AFB and Titan 34D launch incentives for a launch that has been rescheduled from FY 1985 to FY 1986. The impact of not funding this requirement is the Air Force's inability to fulfill contractual commitments to pay launch incentives.

In summary, the $192.9 million increase in real growth supports new capabilities in three important programs (CSOC, GPS, and Shuttle launch from Vandenberg AFB), critical upgrades to the SCF, and support of planned Atlas/Titan launches.

INCREASED FUNDING FOR SPACE SUPPORT PROGRAMS

QUESTION: It appears the Congress will approve no more than an increase in defense spending for inflation. Does the Air Force feel space support programs will require increases above inflation even if it means other Air Force programs will suffer program decreases?

ANSWER: The Air Force Space Support Operations and Maintenance (O&M) program in Major Force Program III has $192.9 million of real growth (not including inflation) for Fiscal Year 1986. The growth is needed to support launch and orbital support for operational Department of Defense (DOD) space programs. Specifically, the increase is due to the initiation of operations for the Consolidated Space Operations Center (CSOC) and the Navstar Global Positioning System (GPS) control segment, and to the initiation of launch operations to support two DOD Shuttle missions at Vandenberg AFB. The Air Force has already made a significant investment in facilities and equipment to support CSOC and GPS programs and the Vandenberg AFB launch and landing site. In Fiscal Year 1986 these programs are starting their transition from acquisition to operations. The Air Force must preserve the capabilities provided by these programs and considers the real growth in space support to be essential even in the austere budget environment for FY 1986.

PRIORITY OF SPACE O&M SUPPORT

QUESTION: What priority does Space O&M support have compared with support for other Air Force missions?

ANSWER: The Air Force corporately determines the composition of its funded programs. The merits of all competing programs are carefully weighed during this process to ensure the optimum national defense capability is procured in support of Defense Guidance and national policy. The priority of O&M support is not unilaterally determined in isolation from decisions in the other appropriations. Once the programs and force structure are approved, the requisite O&M support is computed based on the latest cost factors (work year cost, flying hour cost, etc.). The O&M budget is in balance with the approved program. It should only be increased or decreased by adjusting the programs to be supported accordingly.

TOTAL COST OF THE SPACE BUDGET

QUESTION: What is the total cost of the space budget by appropriations in FY 1986?

ANSWER: The Space Budget breakout for FY 1986 by appropriation is as follows:

($ s In Millions*)

Appropriation	FY 86 Request
RDT&E	4,040
APAF	100
MPAF	3,080
OPAF	1,570
O&M	1,630
MILCON	100
MILPERS	430
Total	10,950

* Rounded to the nearest $10 million

SATELLITE CONTROL FACILITY

QUESTION: What missions are performed at SCF which will not be performed at the CSOC when it is fully operational? What functions will be performed at both SCF and CSOC?

ANSWER: The SCF will transfer operational support of military space missions to CSOC. The SCF will retain the research and development functions to include launch support, on-orbit checkout of missions prior to operational turnover, anomaly resolution and support of R&D satellite missions. The SCF will continue to provide development and sustaining engineering to the continually evolving AF Satellite Control Network, of which CSOC is a part.

The SCF and CSOC will both maintain full operational communications connectivity and the capability to schedule and control satellite operations from either control node.

SPACE CONSTRAINTS AND SECURITY IMPLICATIONS

Question: Considering the space constraints and security implications at and around the satellite control facility. Does the Air Force have plans to relocate the facility?

Answer: The Air Force has no plans to relocate the Satellite Control Facility (SCF), Sunnyvale, CA, complex. The movement of operational mission control centers to the Consolidated Space Operations Center has provided a second node to reduce threat impact; and, with recent SCF facility additions, has alleviated some of the SCF space constraints. Additionally, the SCF has been upgraded to a Class A security installation.

SPACE BOOSTERS

QUESTION: The FY 85 budget included a $3.8 increase for a classified launch to be performed in FY 1986. A launch scheduled for FY 1985 adds another $1.9 million. Is this an additional launch? What is the requirement for additional funds? Where is the program decrease associated with the FY 1985 launch which did not occur?

ANSWER: A portion of the decision last year to procure three Transtage upper stages and complete assembly of the last Titan 34D (Titan 34D #16) involved extending all Titan launch services, including Transtage, through the Titan 34D #16 launch in the second quarter of FY 1988. Initially, the plan was to charge the extension of Titan/Transtage launch services to the classified user funding the assembly of Titan 34D #16. However, the Air Force has amended that plan such that Space Boosters will continue to fund for Titan/Transtage launch services through the last launch.

With regard to the $1.9 million increase in FY 1986, a portion of the Space Boosters O&M budget involves payment of launch incentives for Titan 34D successful launches. Rules governing O&M funds require the incentive funds to be budgeted in the same year as the launch. In this particular case, a Defense Systems Communication Satellite (DSCS), scheduled for launch in FY 1985, has been delayed to FY 1986. As a result, the FY 1985 program has decreased and the FY 1986 request has increased accordingly. The excess FY 1985 funds were reprogrammed to other Air Force programs after the FY 1986 Budget documentation was forwarded to Congress.

ATLAS E O&M REQUIREMENT

QUESTION: Why is the Atlas E O&M requirement increasing with the loss of the R&D mission? Why can't efforts be curtailed if there is no longer an R&D mission? What is the total program cost by appropriation for FY 85 and FY 86?

ANSWER: The total funds required to sustain an Atlas E launch capability decrease after the last R&D mission. However, since most of the Atlas E launch service is common to all programs, the loss of one program affects the "standing Army" cost only slightly. The Air Force budgeted the Global Positioning System (GPS) Block I satellites and Atlas launch services using RDT&E funds. Now that GPS, the only RDT&E customer on Atlas, is transitioning into its Block II operational satellites for launch on Shuttle, the Atlas program has lost its only RDT&E customer. Therefore, the common portion of the launch capability that had been funded in the RDT&E appropriation will be budgeted in the O&M appropriation beginning in FY 1986.

The total Atlas budget, by appropriation for FY 1985 and FY 1986, is as follows:

	FY 85	FY 86
RDT&E	$ 4.5	$ -
O&M	30.5	33.6
	$ 35.0M	$ 33.6M

FY 86 REQUIREMENTS FOR SOPC PORTION OF CSOC

QUESTION: The FY 85 budget revision indicated slippage of the SOPC portion of CSOC. What is the effect on the FY 1986 requirements?

ANSWER: The FY 1986 funding request is consistent with the action taken in the spring of 1984 to slip SOPC by 2 years. This decision reduced the FY 1985 funding request by $42.2 million and the FY 1986 funding request by $92.9 million.

FY 86 FUNDING REQUIREMENTS FOR CSOC

QUESTION: If CSOC will not be fully operational until FY 1989, why is $81.6 million required in FY 1986?

ANSWER: The CSOC program plans an incremental buildup of operations and maintenance (O&M) starting in FY 1986. The FY 1986 funds provide for facilities activation at Falcon AFS, technical support for Satellite Operations Center systems integration and test, software maintenance, training, communications leases, civilian personnel, office equipment, contract equipment maintenance, and related support functions. Facilities and operations support must be available to the Global Positioning System Master Control Station (GPS MCS) operations starting in April 1986. Increased O&M will be required to support Mission Control Center (MCC) 1 in 1987, MCC 2 and Shuttle Contingency Recovery in 1988 and Shuttle planning in 1989.

CSOC MISSION IN FY 86

QUESTION: What percent of total CSOC mission when fully operational will be performed in FY 1986?

ANSWER: When fully operational, CSOC will include two mission control centers, one Global Positioning System Master Control Station (GPS MCS), a Milstar Master Control Center and a Shuttle Operations and Planning Complex. Only the GPS MCS will be operational during FY 86, constituting about 20 percent of the CSOC mission.

CSOC FUNDING REQUEST

QUESTION: What portion of CSOC funding request is for starting up the new facility and what for recurring operations?

ANSWER: The following table shows the recurring and non-recurring funds requested for CSOC in FY 1986 (in $ millions).

	NON-RECURRING	RECURRING	TOTAL
RDT&E	87.4	0	87.4
OTHER PROC.	17.6	0	17.6
O&M	25.6*	56.0	81.6
TOTAL	130.6	56.0	186.6

*Non-recurring O&M funds contractor operations and maintenance from start of operations until organic resources assume control and funds one time software installation.

TRACK OF CHANGES FOR CSOC FUNDS

QUESTION: Please provide a track of changes for CSOC funds from the FY 85 request to the current estimate for FY 85.

ANSWER: The difference between the FY 85 request for Research, Development, Test and Evaluation (RDT&E), and Other Procurement funds ($241.9M) and the current FY 85 estimate ($204.4M), reflected in the FY 1986 President's Budget request documentation, is a result of reduced Congressional appropriation. All funds appropriated for CSOC in FY 85 are planned for CSOC with the exception of $9.9 million of Other Procurement funds reprogrammed to the Air Force Satellite Control Facility (SCF). The reprogrammed funds are needed for the SCF Data Systems Modernization project which is vital to transition satellite operations to CSOC.

CONTROL CENTER NAVSTAR GPS

QUESTION: The budget requests an increase of $6.8 million for operation of the Control Center Navstar GPS. Has there been any change in the scheduled IOC? If so, what is the effect on the funding requirement?

ANSWER: There has been no change in the scheduled IOC for the Navstar GPS Control Center. IOC is still planned for Apr 86.

The Control Center is currently undergoing final testing at its interim location on Vandenberg AFB, CA. It will be moved to the Consolidated Space Operations Center at Colorado Springs starting in Oct 85. The $6.8 million increase in operations and maintenance funding is to support the initial activation of the 211 person detachment which will man the Control Center.

SLIPS IN THE SPACE SHUTTLE PROGRAM

QUESTION: What is the effect of continual slips in the space shuttle program on the Air Force O&M requirements?

ANSWER: For FY 86 and beyond, slips in the Space Shuttle program will have little effect on Air Force O&M requirements at Vandenberg unless a slip significantly compresses the time between launches. The Shuttle Processing Contractor support for Vandenberg is established on a minimum manning concept using TDY support from the Kennedy Space Center to supplement the Vandenberg team for launch activity. After achieving the initial operational capability in October 1985, the basic cost to maintain a Vandenberg launch capability does not change significantly for up to four launches per year. However, if changes in the Shuttle Program result in more than four launches in one year or in minimal turnaround time between launches, overtime support at Vandenberg and additional TDY support from the Kennedy Space Center would be required.

FIRST VANDENBERG SHUTTLE LAUNCH

QUESTION: What is the current estimate date for the first Vandenberg shuttle launch?

ANSWER: Per NASA's March 85 manifest, the first Shuttle launch from the Vandenberg Launch and Landing Site will occur on 20 March 1986.

EXPLAIN THE PROGRAM INCREASES

QUESTION: Please explain the program increases for secure operations, increased payload integration and increased range support costs.

ANSWER: The funds for secure operations reimburse NASA for the DoD Controlled Mode operations which support secure DoD operations at the NASA centers, and for the associated communication lease cost to interface the NASA centers. Funds are also provided to secure systems modified as a part of the NASA modernization programs. The increase is due to the need to secure systems upgraded or reconfigured as a part of the NASA modernization program. The funds for payload integration provide for recurring integration and planning activity necessary to verify physical and environmental interfaces for DoD payloads and missions. The increase is due to the increased number of DoD missions in FY 86 and the commencement of operations from Vandenberg AFB. The increase in range support costs reflect the increasing number of Shuttle launches planned by NASA. NASA does not reimburse DoD for range support to the Space Shuttle.

ANNUAL COST OF OPERATIONS AT CSOC AND VANDENBERG

QUESTION: What will be the annual cost of operations at CSOC and Vandenberg when each is fully operational? In what fiscal years will fully operational capability occur?

ANSWER: The annual cost of operations at Vandenberg, when fully operational, will be approximately $400 million per year in FY 1985 dollars. The Vandenberg Launch and Landing Site will be fully operational in FY 1988.

The annual cost of CSOC operations, when fully operational, is projected to be $210 million per year in FY 1985 dollars. The CSOC, as currently programmed, will be fully operational in 1992.

SPACE BASE OPERATIONS

QUESTION: The base operations performance criteria for Force Program III supports a requirement for $41 million. How will this be accomplished when only $35.8 million is requested?

ANSWER: The requirement is only $35.8 million. The services for bachelor housing operation and furnishings and other base services are inapplicable to MFP 3 and were inadvertently included in the exhibit.

BASE AND INSTALLATION SECURITY SYSTEM (BISS)

QUESTION: The request for Base and Installation Security System (BISS) requirements includes an increase of $2.86 million for new projects. What programs completed during FY 1985 offset this increase?

ANSWER: The Long Ported Coaxial Cable Sensor, an improved buried cable sensor, the Magnetic Intrusion Line Sensor Signal Processor, for use in improving performance of existing buried cables, and the Mobile Individual Resource Protection Sensor all will complete development during FY 1985, and are scheduled for production. New systems beginning development in FY 1986 include the Waterside Security System, the Foliage Penetration Radar and the Radar Airborne Intrusion Detection System.

QUESTIONS SUBMITTED BY SENATOR ANDREWS

CRITICALLY IMPORTANT EDUCATIONAL PROGRAMS

QUESTION: The Center for Aerospace Sciences in North Dakota is developing a space education program to help in preparing our future national space workforce. Their goal is to develop a national center of excellence for Space Technology and Application Resources (STAR) to apply to both the national and defense needs. This program will have an intense focus on space technology with an interdisciplinary oriented curriculum based on space applications with particular interest in lunar bases, space stations, and commercial applications in space. With a need to establish critically important educational programs exploring commercial and military space objectives, how can universities such as the University of North Dakota assist?

ANSWER: Development of a strong infrastructure often begins at universities where we are educating our future scientists and engineers, and where we conduct the vast majority of early research leading to a future capability. It is clear that universities will continue to be a very important resource available to the Air Force. As the Air Force becomes more involved in space related activities the increased need for both scientists and engineers, and basic research will be evident. Universities such as the University of North Dakota will be a vital part of developing the supporting infrastructure for space related activities. Universities with proposals relating to Air Force needs in basic research should forward them to the Air Force Office of Scientific Research (AFOSR) at Bolling AFB, Washington, D.C.

COMMERCIAL AND MILITARY SPACE OBJECTIVES

QUESTION: How might the expertise of the UND staff and facilities enhance programs directed towards goals exploring commercial and military space objectives?

ANSWER: By developing a strong educational and research program the University of North Dakota will be in a position to effectively compete for contracts and grants supporting the Air Force basic research program. Universities are a key ingredient in providing the expertise to develop the supporting infrastructure for Air Force space related activities. As the Air Force becomes more space oriented the need to use the capabilities of qualified universities for longterm research programs will increase. We have the process to effectively use universities who have technical capabilities that are directly related to Air Force research needs, and encourage their participation in our program.

QUESTIONS SUBMITTED BY SENATOR KASTEN

CELVs AS BACKUP TO SHUTTLE

QUESTION: Mr. Aldridge, the Air Force is buying ten CELVs. Beginning in 1988, two of these will be launched a year. What plan do you have to keep a number of these on hand as a backup to the Shuttle?

ANSWER: The basic rationale for the CELV is to provide an operational system to complement the Space Shuttle. Unlike boosters in reserve, assured access requires operational readiness. Operational readiness requires experienced, motivated, and proficient crews; strong logistics support; and an active and healthy industrial base. None of these can be obtained by simply building and storing the vehicles until they are needed in a crisis. The vehicles must be launched; the crews must be active, and the industrial base must remain viable.

Space launch vehicles are exceptionally complex delivery systems operating at the limits of their capabilities. To maintain a launch team at the level of proficiency and experience needed to respond to a launch call, the team must be actively engaged in frequent vehicle launches or it must participate in a very comprehensive, and continual readiness and training program. With vehicles and missions as complex as those required for satellite launches, the cost of training could easily equal (and possibly exceed) the cost of launching. Thus, by training but not launching, we would in effect pay double for each of the ten CELV launches purchased--once for all costs associated with launching the spacecraft on the Shuttle, and again for purchasing a CELV and training and maintaining the "standing army" launch crew for the CELV without using it.

By launching the CELVs at a limited rate of approximately two per year, we pay only once for the launch; we maintain an active, proficient, experienced, and motivated launch team; and, we keep an ongoing production line to provide the needed logistics support and a viable industry.

The future beyond the ten launched CELVs will be determined as a result of the Presidentially directed DOD and NASA joint study for the development of a second generation space transportation system. More than likely this study will result in follow-on vehicles of substantially greater capability than the current Shuttle and CELV. Therefore, the CELV complement, if not used, would become obsolete.

Thus, in terms of readiness to provide assured access, in terms of costs, and in consideration of future capabilities, the most effective implementation of the CELV is to team it with the Shuttle to provide an active, viable, and robust national launch capability.

DOD MISSIONS PER YEAR

QUESTION: Mr. Aldridge, to keep the production line up, CELVs must continuously be used and replaced. At the same time DoD has an agreement with NASA to use one third of the Shuttle space shots. How many DoD missions per year are needed to meet both these requirements? Is there a need for this amount of missions?

ANSWER: Depending on satellite launch requirements, the DoD expects to launch approximately two CELVs a year between FY 1989-FY 1993. The production of the ten CELVs will begin in FY 1986 and complete in FY 1990. With the exception of existing ELVs to be flown out, and the thirteen small satellites planned for launch on modified Titan IIs between 1988 and the mid-1990s, all remaining DoD satellites will rely on the Shuttle. The number of DoD missions planning to launch on Shuttle varies from year to year, but averages approximately ten equivalent Shuttle flights between FY 1988-FY 1995.

There is a defined national security need for the missions which DoD is planning. DoD plans only those missions for which firm requirements exist. Current launch projections for all DoD satellites are based on force structure requirements, and are fully reflected in the DoD's FY 1986 budget submittal to the Congress.

ASSURED ACCESS TO SPACE

QUESTION: Mr. Aldridge, you said "an alternative to buying CELVs might be acquiring a fifth orbiter. But the purchase of a fifth orbiter does not provide assured access to space."

Would you explain how the CELV assures access when a 5th orbiter does not?

ANSWER: A fifth orbiter cannot provide assured access to space primarily because any unforeseen technical problems could ground the entire orbiter fleet regardless of the quantity of orbiters involved. In the past, problems have grounded both manned and unmanned systems for extended periods. The last experience we had with the failure of a manned system was when the Apollo program was grounded for nearly 2 years after a capsule fire. More recently, the unmanned Inertial Upper Stage was grounded 21 months after discovery of a design flaw, despite heroic efforts to accelerate a launch. These kinds of fleet groundings would impose a severe national security risk if we had only one system for placing our most critical payloads into orbit. For these reasons, a complementary Shuttle/CELV team is required. An ongoing, independent launch capability will provide DoD the assurance that critical national security satellites have a means for access to space in the event the Shuttle experiences technical difficulties and cannot launch.

Additionally, while a fifth orbiter is not required to support a 24 flight per year launch rate (NASA states that four can handle the projected missions) the cost of a fifth orbiter versus CELVs is prohibitive. As the following table shows, the cost is almost double that of the CELVs.

CELV VERSUS FIFTH ORBITER COST (FY 85 DOLLARS)

10 CELV FLIGHTS	
NONRECURRING	.394B
RECURRING*	
BOOSTER	.823B
CENTAUR	.465B
	1.682B

*BREAKOUTS ARE ESTIMATES

FIFTH ORBITER PLUS 10 FLIGHTS	
NONRECURRING	-0-
RECURRING	
FIFTH ORBITER* PLUS 10 CENTAURS	2.192B
10 FLIGHTS AT CURRENT SHUTTLE FLIGHT CHARGE	.650B
SUBTOTAL	2.842B
POTENTIAL ADDITIONAL COST FOR FULL COST RECOVERY	.312B
	3.154B

*SOURCE: ROCKWELL COST ESTIMATE TO NASA

Questions Submitted by Senator Stennis

USE OF TITAN II MISSILES

QUESTION: Several years ago, DoD made a decision to deactivate the 54 Titan II ICBM launcher sites. DoD is now proposing to convert 13 of the deactivated missiles into space launch vehicles for placing payloads in certain special orbits.

How many usable Titan II missiles remain?

How was the decision made to convert only 13 missiles into launchers?

What will be done with the remaining Titan II missiles?

ANSWER: Including the spare missiles and those being deactivated, a total of 56 Titan II missiles will be put into storage at Norton AFB, California.

Based upon our successful experience with the Atlas ICBM and Thor Intermediate Range Ballistic Missile, we examined the potential use of deativated Titan II ICBMs as space launch vehicles. Titan II performance characteristics limit its use as a space launch vehicle to placing small payloads into low earth orbits. Selection of payloads for Titan IIs was governed by mission performance and cost considerations. The payloads selected are largely for launch-on-demand missions to unique orbits which require a flexibility of launch date and profile not efficiently accommodated by the Shuttle. Currently, launch requirements through 1996 are for 13 launches for satellites in this category--6 for the Defense Meteorological Satellite Program, 6 for a classified program and 1 for the Navy Remote Ocean Sensing System.

The remaining Titan II missiles will be stored at Norton AFB. All related historical data, spare parts and support equipment will also be stored and be available for future use, if required.

STATUS OF VANDENBERG AFB SHUTTLE LAUNCH SITE

QUESTION: The Air Force is preparing Space Shuttle launch facilities at Vandenberg Air Force Base in California. Currently, all shuttle launches are made from Cape Kennedy, Florida. Within the last year, there have been charges that the Vandenberg shuttle facilities have: Extensive defective pipe welding; contamination of the valves of oxygen storage facilities; erroneous electrical wiring. What is the current status of the construction effort at Vandenberg?

ANSWER: The welding problem has been fully resolved. The subcontractor involved was terminated by Martin Marietta, the prime contractor at the Vandenberg Launch and Landing Site (VLS). The welds were examined by a new subcontractor and, where required, were repaired. The Air Force Inspector General team documented 8 items at the completion of their review, mostly dealing with the Quality Assurance Program; all actions to correct their findings have been completed. The activation effort is on schedule to achieve the initial operational capability in October 1985. The basic construction effort is complete and installation of equipment is scheduled to be completed by early June 1985. Installed equipment in all facilities is currently in checkout testing with testing scheduled for completion in September 1985. The Flight Verification Vehicle testing using the orbiter Enterprise to test vehicle processing facilities and procedures was completed in March 1985 with no significant problems encountered.

TESTING AT VANDENBERG

QUESTION: What testing has been done or is planned to ensure that the facilities will be in proper working order before the first Shuttle launch from Vandenberg? When is the first launch planned?

ANSWER: The following major tests have been completed:

(a) Software Development and Verification Testing: All software associated with orbiter processing and checkout has been completed and verified against a mathematical model of the system.

(b) Facility Verification Testing: Orbiter 101 (Enterprise) was processed through all facilities involved in the prelaunch flow to verify physical fit and configuration, and the Solid Rocket Booster segments, External Tank, and the orbiter were mated on Space Launch Complex-6 to verify physical fit and launch configuration.

(c) Ground System Testing: The nitrogen, helium and electrical power distribution systems have been exercised and their operation verified.

The following major tests are scheduled prior to the first launch:

(a) Commodity Flow Ground System Testing (September 1985): Required to demonstrate the proper function of the main propellent, hypergolic and power reactant storage and distribution systems.

(b) Flight Readiness Firing (February 1986): Orbiter 103 (Discovery) will be stacked on the launch pad with the Solid Rocket Boosters and the External Tank in launch configuration; the orbiter's main engines will then be fired to verify all facility and ground support systems and procedures are prepared to support a launch. (No crew will be on board the orbiter for this test.)

(c) Countdown Demonstration Test (March 1986): The launch team will proceed through the final countdown, except for firing the Shuttle engines, with the flight hardware in place to demonstrate the readiness of the launch team and flight hardware. (The crew will be on board the orbiter during this test.)

The first launch from Vandenberg is currently scheduled for 20 March 1986.

IMPACT OF SDI ON AIR FORCE SPACE PROGRAMS

QUESTION: The Strategic Defense Initiative gives the SDI Organization control over research on certain activities in space. How has the establishment of the SDI affected Air Force space activities?

Have any space programs of interest to the Air Force been delayed or cancelled by SDIO?

ANSWER: The creation of the SDI as a focused research and technology thrust for nuclear ballistic missile defense has had little affect on the Air Force's near-term (pre-1995) space program. The initiative, however, includes several research and technology programs that were previously begun by the Air Force to support operational requirements for space surveillance, space defense, and ballistic missile tactical warning/attack assessment.

No previous Air Force space programs that were absorbed by the SDI program have been delayed or cancelled by the SDI Organization. In many instances, greater emphasis has been placed on these programs because of their criticality to the SDI. Examples of these programs are: Boost Surveillance and Tracking System (BSTS); Space Surveillance and Tracking System (SSTS); and ground- and space-based lasers. Also, the generic space system survivability technology program has been given a boost in funding by the SDI program in addition to that already funded by Air Force programs.

The Air Force plans to use the technology developed under the SDI program for its future space systems that are not a part of ballistic missile defense. Air Force unique requirements have been taken into consideration by the SDIO when performance criteria are set for the various SDI technologies.

STATUS OF AIR FORCE SPACE CONTRACTS

QUESTION: The latest DOD Selected Acquisition Reports (SARs), released in March 1985, provide data on seven Air Force space programs (IUS, NAVSTAR, DSP, DSCS III, DMSP, OTH Radar, and Space Defense and Operations).

The SAR provides cost and schedule data on 26 major contracts in support of these space programs. Of these 26 contracts:

16 contracts (62%) are reported as having unfavorable cost variances or cost overruns;

24 contracts (92%) are reported as having schedule variances or being behind schedule.

What is the significance of these reported cost overruns and schedule slippages on individual contracts?

Do these problems on individual contracts suggest that we may expect major cost overruns and schedule slippages in entire programs?

ANSWER: No major cost overruns or schedule slippages are anticipated for the Air Force Space contracts referenced.

The following detailed information is provided relative to the status of the individual contracts:

- For the seven DMSP contracts, there are no significant program impacts or schedule slips. In each case, the estimated price at completion is not significantly different from current contract target price and is within contract ceiling and budgeted funding. Major cost overruns and schedule slippages are not expected.
- For the five DSCS III contracts, there are no unfavorable variances in contract performance and major cost overruns or schedule slippages are not expected.
- For the two IUS contracts, small cost overruns and schedule slippages have occurred and are due primarily to the resolution of the in-flight anomaly and implementation of a recovery plan to modify all remaining vehicles. Negative schedule variances have almost been eliminated. No major cost overruns or schedule slippages are expected.
- For the six DSP contracts, only the RDT&E contract had small cost growth. The growth was due to technical difficulties with the laser cross link, which have been corrected. This variance will have no impact on either target price or schedule. No major cost overruns or schedule slippages are expected.
- For the five GPS contracts, three RDT&E contracts had cost

and schedule variances. None of these represent any significant cost problems as all these fixed price type contracts are at ceiling and the contractor is responsible for all additional costs. One of the RDT&E contracts with variances has been completed and another is due to be completed by end of FY 85. There are no overall program schedule impacts associated with any of the minor schedule variances.

- The OTH-B radar system will ultimately consist of 12 sectors. The first three sectors will be deployed on the East Coast. The unfavorable cost variance on the sector 1 contract means the contract will reach its ceiling price. The budget was prepared assuming this would occur, so the SAR funding profile contains the funds required to meet this obligation. No impact to the program is anticipated. The unfavorable schedule variance on the sector 1 contract results from delays in the development and test of the computer programs. This variance will have no impact on the hardware fabrication schedule for any OTH-B sector. The variance could impact acceptance test dates for the first three sectors and the initial operational capability date for the East Coast Radar System. It will have no impact on the West Coast, Central or Alaskan Radar Systems. A small unfavorable schedule variance continues on the sector 2 contract. This variance results from late delivery of components from various vendors to the prime contractor. Even if it is not corrected, the variance will have no impact on the OTH-B program schedule or on delivery of any other sector.
- There are six contracts reported on the Space Defense System Program (ASAT) SAR. Four of the contracts are for RDT&E and two for production. Under the RDT&E contracts, Vought Corporation builds the upper stage of the ASAT missile including the miniature vehicle, Boeing Company builds the lower stage of the ASAT missile and the carrier aircraft equipment, AVCO builds the instrumented test vehicle (target satellite), and Logicon provides software validation and verification. The Vought contract has unfavorable variances for cost and schedule caused by technical problems, mainly with the miniature vehicle, and late delivery of components and subassemblies from vendors and subcontractors. The AVCO cost and schedule variances have arisen from late delivery of piece parts, a situation which has been corrected. The Boeing cost and schedule variances (less than 1%) have been caused by adding additional manpower to meet test program needs. The Logicon variances in cost and schedule (less than 1%) have been caused by the technical difficulties in the Vought contract, as the software validation and verification must await input from Vought and Boeing. Under the production contracts, Vought builds the missile upper stage, including the miniature vehicle, and Boeing builds the missile lower stage. The cost and schedule variances to date have been caused by late submission of subcontractor billings.

While variances on individual contracts taken collectively can represent a large dollar value, there is not a major cost overrun or schedule slippage for the individual programs.

QUESTIONS SUBMITTED BY SENATOR PROXMIRE

EXPENDABLE LAUNCH BOOSTERS

QUESTION: Mr. Secretary, you indicate that the new expendable launch booster the Titan 34D7 has a clear growth (payload) advantage over the STS shuttle of from 10% to as much as four times larger.

Are you suggesting that it is possible we will have to have expendable launch boosters for as long as can be foreseen in the future and that the STS probably will not be able to accommodate the potentially larger payloads the Air Force envisions?

ANSWER: As pointed out in the following table (Source: February 1985 DOD Complementary Expendable Launch Vehicle Report to Congress), no planned National Security Satellites are expected to exceed the performance capability of the Shuttle or CELV until about the year 2000. However, in response to earlier Congressional concerns that the CELV candidates under DOD evaluation had no growth capability, the DOD and NASA study found that the CELV candidates can grow if required.

As to the future, NASA and the Air Force are jointly studying the nature of the next generation space transportation system. Most probably this will include a mix of manned and unmanned vehicles, some of which may have a payload capacity greater than today's launch vehicles.

CURRENT SYSTEMS / FUTURE PROJECTIONS * (U)
(CELV CANDIDATE SYSTEMS)

WEIGHTS/DIMENSIONS OF SATELLITE SYSTEMS IN MISSION ORBITS (Thousands of pounds/width x length)

1985 1990 1995 2000 2005 2010

(Deleted)

(Deleted)

ABILITY OF THE SPACE SHUTTLE

QUESTION: General, is the Space Shuttle currently able to provide the Air Force with a launch capacity for all of the Air Force missions? Does the Space Shuttle have a dependable turnaround time in the estimation of the Air Force?

ANSWER: The Space Shuttle is able to launch all current Air Force missions. During the Shuttle's early development turnaround time advertised to be achievable in the 1980s was 160 hours or 14 calendar days. Now NASA's goal is 28 working days. To date this goal has not been demonstrated consistently.

PRODUCTION LINES FOR EXPENDABLE BOOSTERS

QUESTION: Mr. Secretary, you suggested that holding open production lines for expendable boosters will allow US corporations to compete with the French Ariane space launch vehicle on a more equitable price basis.

Isn't this a direct subsidy for American corporations and why shouldn't they be required to pay for their own development and production line costs rather than asking the taxpayers to do so during a time when every budget item is being examined for possible reductions in the war on the deficit?

ANSWER: The essential nature of the CELV program is to provide a complementary launch capability for assured access to space. As an additional benefit, the CELV program will maintain the defense industrial base which provides this country with its strength in manufacturing and technology, and provides a means of meeting our commitments during crises and conflict. We stand in jeopardy of losing that industrial base for space launch vehicles. Without the CELV our nation would have no space launch vehicle production capability for either DOD or NASA after 1986. This has serious implications for the future. With the DOD becoming more dependent on space, the disappearance of expertise to design and improve space launch vehicles would put us at significant risk.

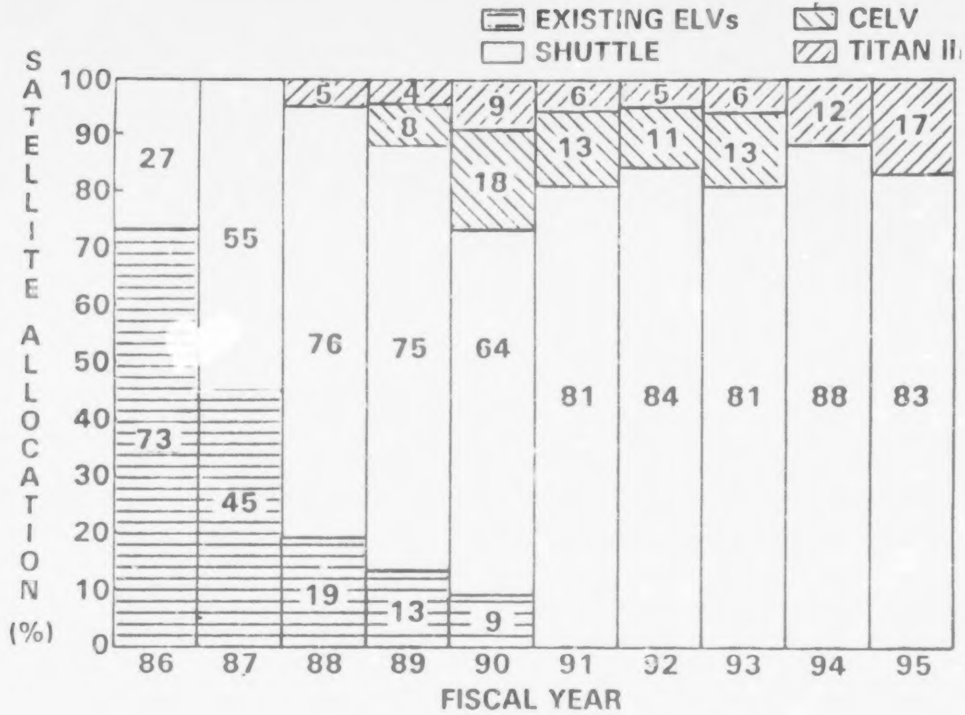
The CELV program is being pursued to satisfy a very specific and critical DoD need. No aspect of the program is aimed at enhancing the commercial sector's ability to compete in the national or international market. Thus, it does not in any way represent a subsidy to industry. The fact that there will be a synergism between the CELV and possible commercial derivatives that could compete with foreign suppliers and strengthen the U.S. economy is a natural and fortuitous occurrence common to a great number of DoD programs.

EXPENDABLE LAUNCH BOOSTERS FOR AF

QUESTION: Mr. Secretary, what percentage of the missions the Air Force had planned to use the Shuttle now will be carried out with expendable launch boosters?

ANSWER: As depicted on the following chart, only 8-18 percent of the missions the Air Force had planned for the Shuttle will now be launched on CELVs. This amounts to a yearly average of 13 percent of DOD's satellites that will rely on the CELV as their primary launch vehicle. The satellites will, however, be compatible with the Shuttle if, for some unforeseen reason, the CELV is not able to launch.

LAUNCH VEHICLE UTILIZATION



ADVANCED RADIATION TECHNOLOGY PROGRAM

QUESTION: In the recently released Public Report to Congress on the Strategic Defense Initiative lists eight space related programs that are not part of SDI. I have questions about two of those programs that are run by the Air Force:

The Advanced Radiation Technology Program (63605F): Under this program, the Air Force used to conduct airborne laser research. As I understand it, part of that research was cancelled and part of the research went to the SDI organization. My questions is what exactly is this program doing now that is different from SDI's research on lasers? Is this a case of overlapping efforts? The Air Force proposes to almost quadruple this program's budget to about $20 million in FY 86. Why such a large increase?

ANSWER: PE 63605F was restructured in FY 1985 to only develop generic high energy laser technology for a broad range of Air Force applications. In FY 1984, the Airborne Laser Laboratory program was completed and in FY 1985 all of the Strategic Defense Initiative (SDI) related technology efforts were transferred to the SDI program. The Air Force high energy laser efforts are not space oriented but are size/power oriented for Air Force applications. In general these technologies will result in smaller, lower power, but higher power to weight efficiency than those technologies in SDI. SDI is focusing on very large, very high power space based and ground based laser systems. PE 63605F is developing high efficiency visible wavelength chemical laser devices. These offer great promise for moderate sized systems. The PE is also developing the various components such as ultra smooth, cooled resonator mirrors and various beam control concepts for this type of system. The major effort in this PE in FY 1986 is the Phased Integrated Laser Optics Technology (PILOT) program. This concept was developed under PE 62601F. [Deleted] Air Force efforts under PE 63605F are not consistent with the large infrared space based chemical laser or the very large ground based laser systems in SDI The Air Force efforts do not duplicate SDI efforts. The Air Force has examined the SDI program and Air Force program in detail to ensure that they are complementary and not duplicative.

Because of the SDI program PE 63605F has been totally restructured to focus on broad based technologies that support a variety of Air Force applications. FY 85 was the year of restructuring the program element to make it fully complementary, and not duplicative of the SDI program. During the restructuring, the funding level of FE 63605F was lower than usual. However, as a result of the restructuring a number of significant generic laser technologies were identified as having high payoff to Air Force applications. The increased funding level for the FY 86 program reflects the new high payoff technologies.

MISSILE SURVEILLANCE TECHNOLOGY PROGRAM

QUESTION: The Missile Surveillance Technology Program (63424F): Is this program doing any research in ballistic missile defense or related to ballistic missile defenses. Isn't there overlap here between the Advanced Warning System research being done under this program and the surveillance research done under SDI? Are we duplicating efforts here?

ANSWER: No, this program is not doing any research related to ballistic missile defenses. The Advanced Warning System research being done under this program was completed in FY 1984. Beginning in FY 1985, this program has been dedicated solely to cruise missile surveillance, and is not duplicating any other effort.

ASAT TEST IN SPACE

QUESTION: Mr. Secretary, exactly when do you plan an ASAT test against a target object in space?

Is that date firm, or is it contingent on any development at the Geneva talks?

ANSWER: Our first ASAT intercept test is scheduled [deleted]. The exact date will depend on the orbit of the instrumented test vehicle (target satellite). The date is not contingent on the Geneva talks.

SUBCOMMITTEE RECESS

Senator STEVENS. We will be in recess until ton

[Whereupon, at 11:35 a.m., Wednesday, May 7,
was recessed, to reconvene at 10 a.m., Wednesday.

BLANK PAGE

368

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

THURSDAY, MAY 9, 1985

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 10 a.m., in room SD-192, Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, Garn, Andrews, Rudman, Proxmire, Johnston, and Sasser.

CONGRESSIONAL BUDGET OFFICE

STATEMENT OF ROBERT F. HALE, ASSISTANT DIRECTOR FOR NATIONAL SECURITY, CONGRESSIONAL BUDGET OFFICE

ACCOMPANIED BY MS. LANE PIERROT

AIR FORCE AIRCRAFT PROCUREMENT AND RDT&E

OPENING STATEMENT OF SENATOR STEVENS

Senator STEVENS. Good morning.

We are here this morning to continue the subcommittee's review of the fiscal year 1986 request for Air Force aircraft procurement and related R&D. Our first hearing on April 25 covered a variety of programs, but a number of issues were not addressed. The most notable of these is the Congressional Budget Office study released just 2 weeks ago on Air Force tactical combat forces.

The CBO study was requested by the committee to examine the affordability of the Air Force tactical fighter-procurement plan. Outyear costs are most important in view of budget constraints being developed in Congress. The CBO alternatives reflect different ways to maintain or expand the size of the force structure and increase capability at a lower cost.

To help the committee examine these options, we are pleased to have Robert F. Hale and Lane Pierrot with us today from the Congressional Budget Office. After hearing from Mr. Hale, our Air Force witnesses, Dr. Thomas Cooper and Lieutenant General Robert Russ will join us again to discuss the CBO findings as well as other budget issues.

Mr. Hale, I want to thank you for the thorough effort that you and your staff have put into this analysis at our request.

Please proceed with your statement.

Mr. HALE. Thank you, Mr. Chairman.

I appreciate the opportunity to testify on issues relating to Air Force tactical combat forces. As you know, the Congressional Budget Office [CBO] has recently completed a report for this subcommittee on those tactical forces, and my testimony reviews the highlights of that analysis.

NEAR-TERM GOALS

In the near term, our analysis suggests that the Air Force can meet its key goals for tactical forces—expanding to 40 air wings, modernizing those wings with F-15 and F-16 aircraft, and replacing old F-4 aircraft—assuming real growth in tactical air budgets of between 2 percent and 7 percent a year through 1990. The percent varies with trends in unit costs for aircraft and support. Alternative approaches that would hold down costs include maintaining F-4 aircraft for longer periods, postponing the buildup to 40 wings, or buying a less expensive aircraft.

LONG-TERM ISSUE

In the longer term, the key issue is the cost of the new aircraft for the 1990's—the advanced tactical fighter [ATF]. CBO's analysis suggests that it would be almost impossible to maintain the current 36-wing force in the next century—let alone expand it—if the AFT experiences the cost growth that has been common during previous aircraft developments. Only if the Air Force can overcome historical precedent and hold ATF unit costs to about 50 percent above F-15 levels—the approximate level of recent Air Force projections—would maintenance of the current force size be probable.

MEETING TACTICAL AIR FORCE GOALS IN THE NEXT 5 YEARS

Over the next 5 years, the Air Force has three basic goals for its tactical combat forces:

1. Build up the force structure from the current 36 wings to 40 wings by 1991;
2. Modernize the force with new versions of F-15 and F-16 aircraft;
3. Retire old F-4 aircraft at about 20 years of age.

The CBO analysis finds that the 5-year defense plan accompanying the February 1985 budget would nearly meet all three of these goals, requiring only that F-4 aircraft be retired at about 21 years of age. Moreover, capability would grow under this plan. By 1992, when all the aircraft purchased over the next 5 years were in the fleet, potential combat capability would have increased above today's levels by about 32 percent. (The model that CBO used to generate increases in potential combat capability involves some subjectivity and many uncertainties, but it is a useful tool—and has been used by the Department of Defense—to compare alternative force structures.)

INCREASED COSTS

The administration plan would increase costs. Based on Air Force assumptions about unit costs, direct costs to procure and operate tactical Air Forces would equal $17.5 billion in budget authority in 1986 and would total about $100 billion over the next 5 years. That amounts to budgetary growth of about 2 percent a year after adjustment for inflation.

Cost increases could, however, be substantially larger. The Air Force assumes that, after adjustment for inflation, procurement unit costs for the F-16 will be about 15 percent lower in 1990 than they are today; those for the F-15 are expected to be 30 percent lower, despite transition to the new "E" model. The 2-percent estimate also assumes that operating costs will increase only enough to keep to keep pace with inflation. Historically, however, unit costs for procurement and operations have increased by substantial amounts. If history repeats itself, meeting Air Force goals could require increases of as much as 7 percent a year in tactical force budgets rather than 2 percent a year.

SLOW MODERNIZATION BY BUYING FEWER F-15 AIRCRAFT

To hold down growth in costs, the Congress could slow modernization, but continue to build toward 40 wings. The Congress could, for example, limit procurement of the top-of-the-line fighter, the F-15, to 36 a year rather than letting procurement increase to 60 a year as the administration currently plans.

Even with fewer F-15's, the Air Force could expand to 40 wings if older F-4 aircraft are not retired until 22 years of age. Moreover, since some F-15 procurement would continue, the Air Force could purchase the new "E" model of the F-15 with its enhanced capability for deep interdiction. Increases in potential combat capability would amount to 28 percent under this option, lower than the 32 percent under the administration's option but still substantial. Costs would be less than those under the administration's option by $0.5 billion in 1986 and by a total of $3.5 billion over the next 5 years.

SLOW MODERNIZATION BY EXTENDING F-4 SERVICE LIFE

If larger savings are required, all further procurement of the F-15 could be terminated, foregoing plans for a new model of the F-15. To accommodate this change and still expand to 40 wings, F-4 aircraft would be kept in the fleet until they reached ages of between 24 and 30 years, depending on the model.

The F-4 airframe should tolerate this later retirement, but old F-4's could become obsolete in the face of increasing Soviet capability. The Air Force could modernize its F-4's to minimize this problem, perhaps along the lines recommended by the Air National Guard. The Guard has suggested that the F-4 be improved by upgrading its electronics and adding fuel tanks to provide longer range.

Even after paying for the upgrade, this alternative would reduce costs by $2.1 billion in 1986 and by a total of about $11 billion over the next 5 years. The resulting fleet would still have 28 percent more potential combat capability than today's fleet.

POSTPONE FORCE GROWTH

Yet another strategy would keep the fleet at today's level of 36 wings, postponing indefinitely the planned growth to 40 wings. Savings under this approach would amount to $0.5 billion in 1985 and a total of $6.8 billion over the next 5 years. Savings would be achieved by buying fewer F-15 and F-16 aircraft and operating fewer wings. The increase in potential combat capability would amount to about 21 percent by 1992.

Comparison of this alternative with the preceding two options could suggest a review of current administration policy. In the face of budget limits, postponing increases in the number of wings appears to be the administration's choice. The date for achieving 40 wings has been delayed in every budget since this administration's first comprehensive plan in January 1982. Yet CBO's analysis suggests that other approaches—such as increasing the number of wings accompanied by extension in the service life of the F-4—might save more money with less reduction in capability.

BUY F-20 AIRCRAFT

Since we completed our analysis, buying Northrop's new F-20 aircraft has been raised as still another option. The Northrop Corp. has offered to sell 396 F-20 aircraft at a fixed price of $15 million apiece, which is less than costs for current versions of the F-16 procured by the Air Force. Since CBO has not yet analyzed this alternative, I cannot supply detailed estimates of costs and capabilities. Any such estimates would depend on answers to a number of questions:

(1) If the Congress and administration chose to buy fewer than 396 aircraft, how would this affect unit costs and Northrop's willingness to begin production?

(2) What changes would the Air Force want in the F-20, and how much would they cost?

(3) How would F-16 costs be affected by competition with the F-20?

(4) Can the Air Force enter into multiyear contracts for either the F-16 or F-20—as both contractors propose—and still anticipate savings from competition?

(5) How realistic are Northrop's estimates of F-20 operating costs, which are substantially lower than those for the F-16?

(6) How would operating costs be affected by having another plane in the fleet?

(7) What would be the mission of the F-20 and what systems would be put on the plane?

Until these questions are answered more fully, the F-20 option—while apparently viable based on presentations by the contractor—cannot be compared in detail with the others in CBO's report.

ADVANCED TACTICAL FIGHTER—KEY TO THE FLEET OF THE 1990'S

Most of the decisions that the Congress and Air Force face over the next 5 years depend on planes whose basic designs were developed in the 1960's and 1970's. The Air Force is now beginning development of a totally new aircraft for the 1990's and into the next century—the advanced tactical fighter [ATF]. Important decisions that affect the nature and cost of the ATF will be made in the next few years, and the results of those decisions could affect the Air Force dramatically in the next decade and beyond.

ADVANCED TECHNOLOGIES

The ATF will exploit a group of new technologies to make it more capable in many ways than aircraft now being procured. In particular, the Air Force would like the ATF to have enhanced avionics, supersonic cruise capability, stealth characteristics, short takeoff and landing capability, high reliability and maintainability, long flight ranges, and improved survivability in environments contaminated by nuclear fallout or biological warfare materials.

Although these enhanced capabilities might be needed to match Soviet improvements, they probably will make the ATF very expensive. That, in turn, will dramatically affect the Air Force's ability to maintain the current size of its fleet.

CBO ANALYSIS

Our analysis suggests that it would be almost impossible to maintain the current 36-wing force in the next century—much less expand it—if the ATF experiences cost growth that has been common during previous aircraft developments. After adjustment for inflation, "flyaway" costs per aircarft—that is, costs excluding spare parts and ground equipment—for the F-15 were almost three times those of the F-4; flyaway costs of the F-16 were almost twice those of the F-4. If ATF flyaway costs are double those of the F-15, the Air Force would be able to maintain only 29 wings, rather than the current 36, under reasonable assumptions about other factors the affect force size. Only major and probably unrealistic changes in these other factors would preserve today's fleet size. For example, if ATF costs double, the Air Force could maintain close to 36 wings only if the low-cost fighter in the force mix is a F-16 aircraft that experiences no real cost growth. But the Air Force has already announced plans for an improved F-16 that is likely to cost more. The Air Force could stay close to today's force of 36 wings if AFT's comprise only about 20 percent of the fleet, but over the last 10 years high-cost aircraft averaged 34 percent of Air Force aircraft procurement.

Maintenance of the current force of 36 wings seems unlikely unless the Air Force overcomes historical precedent and holds the costs of the ATF to 50 percent above F-15 levels, the approximate level of recent Air Force projections. Even then expansion to more than 36 wings would require optimistic assumptions about other factors that influence force size.

TACTICAL AIRCRAFT BUDGET ASSUMPTIONS

All these numbers assume that tactical aircraft budgets receive annual real increases of 3 percent, similar to the average of past increases in the gross national product. Expansion in numbers of wings, even with large growth in ATF costs, would be quite feasible if tactical funding increased over the next decade by, say, 5 percent a year after adjustment for inflation. But this greatly exceeds what history suggests will be allowed for tactical forces; from fiscal year 1964 through fiscal year 1983, funds for procurement of tactical aircraft increased by only about 2 percent a year. Moreover, there are many other competitors for defense dollars, both strategic and conventional, that will make it difficult to sustain large growth in tactical Air Force budgets.

AIR FORCE OPTIMISTIC ASSUMPTIONS

Our results contrast with those in a recent Air Force study that suggests the ATF will be affordable. That study, however, makes optimistic assumptions. Total unit costs of the ATF are assumed to increase by only 20 percent, despite increases of 60 percent in flyaway costs, apparently because of expected reductions in the cost of ground equipment and spare parts. Also, the study assumes that the unit costs of an F-16 would decrease by about 22 percent by 1991 while those of an F-15, despite its impending model change, would decrease by 33 percent. Even with those assumptions, the study finds its plan affordable only by assuming that tactical aircraft enjoy the same share of the Air Force budget as in the late 1970's, when the United States was buying many tactical aircraft.

The Air Force study shows that its plan could not be afforded under shares typical of the last 5 years, which are also the portions typical of the last 20 years.

Why worry today about costs of a plane that will not be fielded until the mid-1990's? Fighters take a very long time to develop, and the ATF is already in the beginning development stages. Soon, it is scheduled to go through the first milestone in the development process—the decision to proceed with validation of the design concept.

The further the plane moves into the development process, the more difficult it will be to make design changes. By the time the ATF could have a significant impact on the budget, many fundamental decisions that dictate future costs would have already been made and the options available for savings would be limited. Therefore, it is not too early for the Congress to focus on ATF costs.

COST CONTAINMENT ALTERNATIVES

The Congress could place a cap on ATF costs—perhaps at levels currently estimated by the Air Force—and require an annual report to monitor compliance. Alternatively, the Congress could simply monitor ATF costs through normal hearings and reports. Action on ATF costs would have no substantial effect on today's deficit or even those of this decade, but action today could have a major effect on the choices facing the Congresses and administrations in the decades ahead.

That completes my prepared remarks. Ms. Pierrot and I will be glad to answer any of your questions.

Senator STEVENS. I do thank you very much for that report and for your work.

EXTENDED F-4 SERVICE LIFE

One of the basic premises of your assumption that it is possible to stretch this out is that the F-4 life can be extended at a reasonable figure. I read your report last night and Boeing's report. It is a very interesting one.

I would ask you this: Have you compared the extended life of the F-4 to any history of attempts to extend the life of other fighter planes in the past?

Mr. HALE. I think it would not be a serious problem to extend the life of the airframe perhaps to as much as 30 years. Indeed, the Air Force appears to be planning to extend its life beyond the 20-year goal they had originally set forth.

I think the issue more probably is technological obsolescence in the face of the threat. In that respect, some sort of upgrade would help, although it will not give you the same capability as a new plane.

You could, for example, consider the Boeing proposal. It would re-engine the aircraft as well as provide advanced avionics and conformal fuel tanks, but would be expensive—around $12 million a plane. The Air National Guard's option, which adds only conformal fuel tanks and enhanced avionics, would be $3 million a plane.

From a cost standpoint, upgrading represents both a pro and con. You are going to have to replace the F-4 eventually and upgrading saves money now, but means facing replacement costs in the future.

COMPETITIVE FIGHTING POTENTIAL

Senator STEVENS. We had an argument several years ago about whether that was one of the criteria to be evaluated. It is obvious it is now in terms of the new fighters.

Without the Boeing proposal and National Guard proposal, did your analysis indicate whether they would be still competitive as far as the problem of fighting potential enemy aircraft?

Mr. HALE. You have to think of that as a continuum. The F-4's won't be as competitive as a new plane would be, which is designed to have the latest capability. On the other hand, they will be substantially cheaper. It is a balancing act, and I can't give you a firm answer. The Air Force would, but other experts might give you a different one.

LESS CAPABILITY COST TRADEOFF

I can say though that, if costs are a serious problem, it might be realistic to consider upgrading older aircraft—admittedly resulting in an aircraft with less capability than the new one—and keeping them. We may end up keeping them anyway for a substantial period of time.

Senator STEVENS. That was my next question. If we are required to go beyond the 44 wings, we would have to keep the F-4's anyway.

Mr. HALE. Even with the procurement plan before you now, you would have to retain F-4's longer just to get the 40 wings you would like to have. And I suspect, that you may have to scale that procurement plan back in the face of budget limits. So we will probably have to retain some F-4's well beyond 20 years of service.

TACTICAL FIGHTER FORCE BUDGET SHARE

Senator **Stevens**. Your assumptions, even to provide the modest levels of increase that you have outlined, are based on our being able to keep up the financial support of the late 1970's as opposed to the average of the last 20 years in terms of the percent of the DOD budget.

Mr. **Hale**. I want to be careful. That number was in connection with the long-run question of whether we can field the ATF.

The Air Force study on the affordability of the advanced tactical fighter found its plan affordable only if they assumed that tactical air forces got the same percentage of the budget as in the late 1970's, which is quite a high level relative to its historical share. If they get levels more consistent with the historical share, then they would not be able to afford the ATF as they plan to buy it.

Senator **Stevens**. Did your model compare the priorities between a modernization plan, you know, the ATB and ATF and SDI and the whole concept of Midgetman or is this solely concentrated on the problem of trying to attain and maintain the 40 wings at a minimum?

Mr. **Hale**. The latter, Mr. Chairman. We looked only at tactical air force. That is tough enough for an analyst.

Senator **Stevens**. We are not analysts either.

Senator Proxmire.

Senator **Proxmire**. Thank you, Mr. Chairman.

Mr. Hale, in the first place I want to congratulate you on this testimony. It is extremely useful. It is too bad we didn't have this kind of analysis 10 years ago. We could have made better decisions.

Mr. **Hale**. Thank you, sir.

BUDGET IMPACT OF MAINTAINING ADMINISTRATION ASSUMPTIONS

Senator **Proxmire**. I notice one opinion that you have not considered is supposing we go ahead and buy this at the rate the Air Force wishes to, we have had the kind of problems we have had in the past, one option is to increase taxes, or whatever it takes, what would be the effect on the budget if we did that?

Mr. **Hale**. Our estimates were that if you follow the administration's plan, given their optimistic assumptions about costs, you are talking about a 2-percent annual increase in the tactical fighter budget over the next 5 years, after adjustment for inflation. It would be somewhat higher if we don't utilize optimistic assumptions about unit costs.

In the broader context of the entire defense budget, if you followed plans for tactical force and all the other administration plans, we would have been talking about 6 percent real growth in total DOD budget authority in 1986. That was the original request. I would have to provide for the record the exact increases in the years beyond, but they would be substantial ones.

Senator **Proxmire**. I would like to have that for the record. That might give us another dimension that we might want to consider.

[The information follows:]

Real Growth in DOD Budget

The real growth in total DoD budget authority associated with the fiscal year 1986 submission for the five-year period, fiscal year 1986 through 1990, is as follows:

	1986	1987	1988	1989	1990
Budget Authority:					
Total, in constant fiscal year 1986 dollars	313.7	339.4	369.5	388.0	406.7
Real growth	5.9	8.2	8.8	5.0	4.8

Source: Department of Defense, "Annual Report to Congress, Fiscal Year 1986."

20-YEAR HISTORICAL COST INCREASE

Senator Proxmire. Do you remember the testimony by William Perry, the former Under Secretary for Department of Defense for Research and Engineering?

He said the cost of military fighter aircraft has been increasing tenfold every 20 years since World War II and if this trend continues and the Defense Department budget increases only 3 percent per year, by the year 2110 he said the Pentagon will need to spend its entire budget to buy a single aircraft, one copy.

Is he right about the tenfold increase every 20 years and what is meant if the Air Force would be confined to one plane?

It would be a beauty, I suppose.

Mr. Hale. I think he is carrying the point to an extreme for the purpose of illustration. As far as a tenfold increase, we looked at generations of fighters; there is a table on page 56 of our study that shows ranges of perhaps two to three times the price of the previous generation of aircraft.

Therefore I think we wouldn't have gotten numbers quite as high as 10. I would have to look at Mr. Perry's testimony to determine where he got the tenfold estimate.

However, even if real costs just double, you are going to have a great deal of difficulty maintaining the current force level with a new generation of aircraft. You will have to make optimistic assumptions about other factors that influence force levels.

Senator Proxmire. Will you go back to the record and take a look at this since World War II and give us an assessment of this?

Mr. Perry is not an irresponsible man. We have great respect for him. I think this is the kind of thing that Congress ought to understand.

[The information follows:]

Increase Analysis Since World War II

While CBO was unable to replicate Mr. Perry's analysis exactly, it would appear that his estimate of a 10-fold increase every 20-years since World War II would be accurate for the first 20-year period. In real terms, the flyaway costs of the P-47, first operational in the mid-1940s, were something less than one-tenth of the costs of an F-4, first operational in the early 1960s. Comparing the costs over the next 20-year period would indicate increases somewhat lower than Mr. Perry would have projected, though still quite substantial. F-15 costs were, for example, about three times those of the F-4 while F-16 costs were about twice those of an F-4. As the CBO analysis indicates, even these lower trends, if applied to the ATF, would cause the Air Force difficulty in maintaining the current force structure if real budget growth of about 3 percent is experienced.

TACTICAL FIGHTER COST DECREASES

Mr. Hale, you indicate that the Air Force assumes that procurement unit costs of the F-16 will be 15 percent lower in 1990 in real terms and procurement unit costs of the F-15 will be 30 percent lower in unit terms.

Can you name any Air Force Fighter Program where the real costs have declined over time by these percentages?

Mr. **HALE**. Not over a lengthy period of time, I can't. Again, we will research that if you would like, but I doubt that there are any.

Senator **PROXMIRE**. On the basis of your knowledge and experience and that of your colleagues, I take it you can't give us anything from the top of your head?

Mr. **HALE**. That is right.

Senator **PROXMIRE**. Will you check it out?

Mr. **HALE**. We will.

[The information follows:]

WEAPON SYSTEM COSTS REVIEW BY CBO

CBO reviewed annual weapon systems costs provided by the Air Force for tactical fighter/attack aircraft procured from 1960 to 1983. The only consistent trends apparent were a dramatic decrease in unit costs for the first few years after introduction of a new aircraft or a new model and an increase in costs between new generations of aircraft or new models. Air Force projections for future decreases in the unit costs of the F-15 and F-16 would not appear to be justified by either of these trends since the costs of the new E model of the F-15 are projected to be lower by 1990 than the cost of the C/D model of the F-15 by 30 percent, and the costs of a F-16 are projected to be 11 percent lower even though some of the F-16's are to be follow-on F models. Costs have decreased in the past for aircraft by percentages much larger than those projected by the Air Force but only during initial production years.

AIR FORCE ABILITY TO MAINTAIN CURRENT FIGHTER FORCE

Senator **PROXMIRE**. You make a very disturbing conclusion. You say that if the advanced tactical fighter experiences cost growth common to previous aircraft developments, the Air Force cannot even maintain the current 35-wing force, let alone expand to 40 wings.

Are you saying that cost overruns cause declining force levels, as I have been arguing for the past 15 years?

Mr. **HALE**. Given a fixed budget, that is likely to be what will happen. We will have to buy fewer of them.

Senator **PROXMIRE**. Even with the moderate expanding budget?

Mr. **HALE**. If the ATF doubles in cost, and history suggests that is not unreasonable, and if we get 3 percent annual real growth in the tactical fighter budget, it will take very optimistic assumptions about other factors in order to maintain the current force size.

LACK OF PARTS FOR F-15/F-16 ENGINES

Senator **PROXMIRE**. According to one Air Force spokesman, more than half of the reserve engines for the F-15 and F-16 are unusable for lack of parts.

Is that a normal circumstance and what effect does it have on our war readiness rates?

Mr. **HALE**. Senator, I am not prepared to evaluate that for you right now. Again, if it is useful, we will try for the record, but I can't help you at the moment.

[The information follows:]

SHORTFALL OF REPLENISHMENT SPARE PARTS

CBO has not done an independent analysis of this issue. But the Air Force indicates that the shortfall of replenishment spare parts for the F-100 engine has not significantly affected F-15 and F-16 readiness rates yet. The Air Force projects that F-100 spare engine availability will worsen until August 1985, begin to get better in September 1985, and recover to target serviceable levels by September 1986. The Air Force did not predict what impact, if any, this short-term worsening of availability will have on the rates.

STOCKPILE INVENTORIES

Senator **PROXMIRE**. Are stockpiles low because the engines in the F-15 and F-16 are wearing out too fast?

Mr. **HALE**. Again, I am not in a position to answer that.

EXTENDED SERVICE LIFE OPTIONS

Senator **PROXMIRE**. You seem to say in your report that the Air Force can have its cake and eat it, too, that it can still achieve its goal of 40 wings by extending the service life of the F-4 and at the same time save more money with less reduction in capability.

Why isn't that an option obvious to the Air Force?

Mr. **HALE**. I think it is. I believe they rejected upgrading because you don't get as much increase in capability as you would if you followed their plan and replaced the F-4's with the new aircraft, which have a state-of-the-art technology.

Moveover, we should acknowledge that the analytic model that is used to reach conclusions about capability has some subjective judgments in it. I think that the Air Force feels the model overstates the capability of an upgraded F-4. If that is the judgment of Air Force tactical experts, it is worthy of consideration.

F-20

Senator **PROXMIRE**. A number of us on the committee, the committee chairman particularly, have been interested in the F-20 program. While the questions that you raise are valuable, what we need are answers to your questions.

How about taking a personal crack at those questions? First, do you think the F-20 would have to be upgraded and at what cost?

Mr. **HALE**. Senator Proxmire, I don't think I can do that here. We will be glad to try to look at that. The problem is that those are judgments that are going to be driven largely by decisions about what kind of mission the F-20 has to perform. It would probably be a different design if we decide we want it to be a dog fighter as opposed to a plane for air defense.

I think it would not be helpful for a staffer like me to speculate on mission—or to give you cost numbers without more research. We will be glad to try to do it if we can get answers from the Air Force, which I think they are considering, to the question of what will be its mission.

Senator **Proxmire**. We want to get your independent appraisal. One of the reasons the chairman is so wise to bring you in is to get an independent appraisal.

Mr. **Hale**. I appreciate that. Right now we are not in a position to give it.

EFFECT OF F-20 OR F-16 COSTS

Senator **Proxmire**. Would the F-20 drive the price on the F-16 and by how much?

Mr. **Hale**. I think there would be evidence that F-16 costs would be held down.

Senator **Proxmire**. How much?

Mr. **Hale**. Let me offer the evidence for at least the direction. We have seen the willingness of General Dynamics to accept zero profit in the offer they made to the Navy to supply F-16's for their aggressor force. We have experienced what seems to be a holding down of costs in the engine competition between Pratt & Whitney and General Electric.

How much will costs be held down? The answer is an extremely difficult one to estimate. Northrop assumed a 10 percent reduction in F-16 costs in their presentation to us. I can't tell you if that is a likely number.

NORTHROP COST ESTIMATES

Senator **Proxmire**. How realistic are Northrop's cost estimates?

Mr. **Hale**. That is another tough question. They made a fixed-price offer for a particular plane. I have to take them at their word that they would carry it out.

I think the question is more one of whether they are providing a plane that the Air Force will find acceptable. I know we must learn more about some detailed issues. For example, are the spare parts and ground equipment procurement in Northrop's offer up to the standards the Air Force would want for deploying the plane overseas? Are the numbers of people they are planning in the operating cost assumptions—and the F-20's operating costs are much lower—realistic in a wartime situation?

Senator **Proxmire**. That was my next question.

Mr. **Hale**. I wish I had answers, but I don't. We will be glad to get the answers for you.

Senator **Proxmire**. Would adding the F-20 to the fleet drive up the net operating costs compared to an all F-16 purchase?

Mr. **Hale**. I don't know.

F-20 MISSION

Senator **Proxmire**. Is there a mission for the F-20?

Mr. **Hale**. I think there are certainly some missions it could accomplish. We have seen the Air National Guard and others espouse some missions.

Senator **Proxmire**. Should the F-20 just be bought for the Guard and Reserves?

Mr. **Hale**. I think that goes beyond the judgment that an analyst can make for you.

Senator **Proxmire**. Thank you.

Senator **Stevens**. Those are very interesting questions.

Mr. **Hale**. I wish I had more answers.

Senator **Stevens**. The Senator from New Hampshire.

Senator **Rudman**. Thank you, Mr. Chairman.

I only have a few questions. I have read your report. It is an excellent analysis. I think it lays out a number of assumptions.

CAPABILITY VERSUS THREAT

The problem I have with it—and this is not your fault—is that the linkage between capability and the threat that it faces is really off to one side. This is a very important consideration.

You could go back to the article that Fallows wrote in the Alliance several years ago concerning the age-old debate about numbers versus capability. Your analysis really does not address that, does it?

Mr. **Hale**. No; I think what we tried to do is to say that there is a threat out there and that the Air Force has given you a judgment about what they feel is needed to meet it. Their preferred approach may cost more than you can spend; so we will give you some options. The options probably won't give you as much capability—but they come close—and we will give you their cost. It does require a judgment on whether the options would be adequate to meet the threat. The Air Force contends they aren't.

Senator **Rudman**. That is what we have to decide. In theory we could reopen the P-51 line or the Lockheed P-38 line.

Senator **Garn**. A great airplane.

Senator **Rudman**. I have flown the P-51. It is a great airplane. You could probably have 400 wings for the price of 36 ATF wings. Unfortunately, they would never see the enemy.

Mr. **Hale**. Right.

F-4 UPGRADE

Senator **Rudman**. When talking about the F-4 upgrade in particular, I want to ask you if, while consulting with the Air Force in developing the study, you addressed the assumption that by the early 1990's the Soviets will have their own AMRAAM's of great range. The two forces will meet each other, the Soviets will let go their AMRAAM's from a great range, and all you will see is a lot of parachutes spilling out over the battlefield if they are lucky.

You have not really addressed this assumption, have you?

QUALITY/QUANTITY TRADEOFF

Mr. **Hale**. Yes and no. I think you stated one side of that issue. There is another side, which is that, if you don't have enough numbers in the battle and have difficulty in maintaining forces, you may not be able to sustain combat over a period of time. You face the classic quality/quantity tradeoff.

We have addressed the capability issue in the sense that the model used—which was developed at the request of DOD, but contains subjective judgments—suggests that, while an upgrade F-4 would not provide the same capability as the administration's option, it would provide a substantial increase over what we have today.

Senator **RUDMAN**. For how long?

Mr. **HALE**. We looked at it through 1992 when all the planes bought over the next 5 years are in the fleet.

Senator **RUDMAN**. Don't you think that is grossly inadequate?

Mr. **HALE**. If you look into the 1990's, you are postponing the day of reckoning. Eventually you will have to buy planes to replace the F-4.

BASIC DECISION

Senator **RUDMAN**. That is my point. I don't argue or quibble with you. I think you have done an excellent analysis. At some point this committee, as Senator Proxmire said, has to make a basic decision as to whether or not this money has to be spent.

It is my view that in terms of aircraft development, we have to assume, looking at Soviet technology, that we will be facing a very capable threat. I would rather have fewer aircraft meet the threat that way, than to spend a lot of money on aircraft that could be sought out at great range and destroyed. I would rather have fewer aircraft with more smart missiles aboard and hope to meet the threat that way.

F-20 OPTION

I appreciate your analysis. I think the F-20 option is something I would like you to put in your model and see what comes up. I am not terribly anxious to see us go the F-4 route for a front-line fighter. Maybe the Guard mission possibly.

I would not want to make that trade. I think we are practicing self-delusion. You would not disagree with that? We are looking beyond 1992.

Mr. **HALE**. That is certainly a fair position, Senator. The option we looked at modified about 400 of the F-4's. That might be consistent with the deployment in the Guard.

Senator **RUDMAN**. Mr. Chairman, that is all I have.

Senator **STEVENS**. Thank you very much.

Mr. Sasser.

Senator **SASSER**. Thank you, Mr. Chairman.

I also want to commend you, Mr. Chairman, for bringing to us this morning this testimony which I think gives us some interesting insights that we might not otherwise have. I, too, am concerned about the problem of purchasing ever increasing complex airplanes to meet the projected threat.

SPENDING MORE—GETTING LESS QUANTITY

Foreign Affairs had a report in its most recent edition in which it said that in the last 3 years of the Carter administration defense budget the Air Force purchased an average of 227 fighter planes per year.

In the first four Reagan defense budgets, 1982 through 1985, Air Force purchases of fighter aircraft averaged only 172 per year, a drop of 24 percent.

Now, this raises a number of disturbing questions.

What accounts for this trend where we are spending more and getting less quantity, in your judgment?

SHIFT IN MIX OF AIRCRAFT

Mr. HALE. I have seen a shift in the mix of aircraft we are buying. In the 1970's, for example, the United States bought a number of A-10's, which are relatively inexpensive and had a different mission as well. We stopped that procurement and moved more heavily into more expensive F-16's and continued buys of the top-of-the-line F-15's.

There was also, I believe, some growth in the unit cost of aircraft. This was associated with a variety of factors which included modification of planes and others.

QUALITATIVE/QUANTITATIVE EDGE

Senator SASSER. It is generally conceded that we maintain a qualitative edge over the Soviet fighter aircraft. If ever our aircraft come in contact with theirs in a combat situation, our aircraft generally prevail rather substantially.

I have in mind principally the war in the Mideast, which is explained in substantial part, I suppose, by the superior expertise on the part of the Israeli fighter pilots, but I think the quality of American aircraft figures into that considerably.

By maintaining our technological superiority, we have to contend with larger numbers of Soviet aircraft and we maintain the theory that our qualitative advantage will overcome a quantitative disadvantage.

This in some ways is a reversal of the policy that we pursued in World War II with a number of different weapon systems. I well remember reading about the decision that was made in World War II to go with a tank, for example, that we knew to be inferior to the German Tiger. We could produce the old Sherman tank in enormous numbers and we were going to overcome the superiority of the German tank with quantity.

Conversely, in World War II we overcame the technological advantage of the German jet fighter toward the end of the war with a quantitative advantage of our own fighters.

PLANNING POLICY

I am concerned about the concept of overcoming quantity with a qualitative advantage, particularly when the qualitative advantage depends on an ever increasingly complex weapon which will need more and more maintenance and more and more sophistication not only to build, but to maintain in a combat situation.

What is your reaction? Is this sound planning policy, in your judgment, to move in the direction of the more expensive qualitative superior aircraft as opposed to a more inexpansive one that can be bought in larger numbers?

Would we find our F-15 pilot in Europe, the one single F-15 against three MIG-23's wishing that he were in an F-20 with two other F-20's with him having a numerical quality?

Mr. **Hale**. Let me answer that in the context of the advanced tactical fighter because I think that is where you have the most flexibility to make changes in quantity and quality.

It seems to us that in the Air Force, given what their principal people have written, that there is a great deal of emphasis on quality in developing the ATF. If history is a guide, that will cost us a lot. We could pay substantially, therefore, in quantity. The hard question is, what is the bottom line? How far can you go in reducing numbers?

We took as a bottom line that you would want to maintain at least today's force level. The Air Force says they need 40 wings, probably 44. We felt that today's 36 was a reasonable minimum.

If you make that assumption, which is a judgment, then I think you come to the conclusion that you have to keep the cost of the advanced tactical fighters not much above what they say it is projected to to now—that is, about 50 percent above that of the F-15—in order to have a good chance of maintaining the current force structure under reasonable assumptions of other factors that will affect force size.

That is only a partial answer to your question, but I think it is a useful way to think about it. It is consistent with the military judgment that the Air Force has given you.

Senator **Sasser**. It is disturbing to me, quite frankly, to find we are voting for larger and larger defense budgets and we are buying fewer and fewer aircraft.

The major concern I have, as we look down the road at the development and procurement plan of the Air Force for new aircraft—do you have recommendations that you would make for improving Congress' ability to judge the economic merits of the aircraft that are under development?

COST CONTAINMENT THOUGHTS

Mr. **Hale**. I think the best thought I could offer you is to try to provide some clear guidance and incentives, perhaps in the case of the ATF. Although we don't make recommendations, and I don't want this to be taken as one, you could consider requiring that the Air Force limit ATF costs to those that the Air Force now says they are going to be. If they are going to be any higher, the Air Force should provide information on what tradeoffs we would have to make to keep them at projected levels, that is, at 50 percent above the flyaway cost of the F-15.

That approach would keep you out of the detailed management of the ATF Program, which I think you don't want to be in. At the same time, it would heighten the visibility of cost as the Air Force considers development of the ATF.

Senator **Sasser**. Thank you, Mr. Chairman.

Senator **Stevens**. Senator Garn.

Senator **Garn**. Thank you, Mr. Chairman.

Mr. Hale, let me, first of all, endorse what Senator Rudman has said. Your study is very interesting and well done.

SHORT-TERM DECISIONS BY CONGRESS

One of the things I think we have done very badly over the years does not match up very well with capability.

I also would emphasize in my experience we almost always make the short-term decisions here in Congress, whether that is stretch-out of a weapon system, because it is immediate and it helps this year's budget and then we pay for it many times over.

One of the reasons the Defense budget is as big as it is today is because of the stretch-out we were talking about 10 years ago, we have to cut this year's budget. As long as we get it down the road, we won't worry about that.

I think the question Senator Sasser was asking, whether that pilot would rather have a couple of F-20's with him compared to one F-15, is not the question we were talking about earlier.

The question is, would he rather have a couple of F-4's with him or the F-15? That is what we are talking about in the modernization of the F-4.

I would personally rather be flying the F-15 than 3 old F-4's. It was a marvelous airplane in its time. My experience in the Air Force has been that way. One of the reasons I have so much flight time is because I flew a lot of old slow airplanes.

As I look back, I was always flying something being fixed up. My whole flying experience was in an old airplane, we could not replace, so we put new hubcaps on it. It worked fine in peacetime. It is hard to anaylze.

All the airplanes I flew in the Reserve, in training, worked fine. There is not one I ever flew that I would ever want to go to war with. The Reserves were tickled to death to get F-4's compared to what they were flying. For their training, and so on, it keeps them proficient.

That is the question I don't know how to answer, but it is a very serious question when we make these decisions. Our stretch-out on short terms makes us look better this year. What do they do in the longer run and what is our capability to use those?

The DC-3 is one of the most remarkable airplanes ever flown and some are still flying. But you have to judge what its capability is and for the missions they use them they work fine.

The B-52 is a marvelous airplane. It will be fine into the 1990's. It will be, but what is its capability in relationship to the threat?

I think Senator Rudman brings up a very good question that none of us, I suppose, has an answer for. I think it is something we have to work very hard at trying to answer rather than just looking at it on an analytical basis of what is the cost this year. What will it do for you in terms of the threat, what kind of deterrent does it provide?

In some cases even though you can have more numbers by putting new hubcaps on some old airplanes making it better and everybody thinks it is an improvement, but does that quantity provide what is necessary?

I personally don't think the F-4—not the F-20, that is a different story, the F-20 is a much more modern aircraft than the F-4—I think you could put a lot of money into the F-4 and it would make us look good on paper in terms of quantity, but I don't think too many of my old pilot friends would like to do battle with the Soviet Union in their aircraft with F-4's.

Thank you, Mr. Chairman.

Senator Stevens. Thank you Senator.

EVOLUTIONARY PROGRESS

Let us not be too harsh on the old World War II pilots. At each successive level they were better planes. That is what we are trying to assure now. Each one of the planes we got in the period you are talking about was a quantum leap forward as far as the capability of the aircraft mission it performed.

That is what you are saying. We have to analyze those mission roles.

Mr. Hale. That is right. You are going to have to weigh your judgment about the need for new aircraft and what you can afford, which is something you are doing all the time.

I am not here to espouse the F-4 upgrade. We chose a range of alternatives that we thought reflected what we could perhaps call interesting options—ones that people had judged were relevant to the policy debate.

I think the F-4 upgrade fits that category. It is endorsed by the National Guard and used by some of our allies. However, I understand your position, Senator Garn and Senator Rudman—that this upgrade is not what you want.

Senator Garn. I don't disagree with the Chairman, if that is all we can do.

Mr. Hale. If we are going to keep the F-4's anyway, then it might be more reasonable to consider whether at least some modest upgrading of the avionics is desirable.

Senator Stevens. Senator Johnston.

Senator Johnston. Thank you, Mr. Chairman.

F-16 COST GROWTH

Mr. Hale, you may have covered this, but the F-16 has undergone a tremendous cost escalation. I understand that you stated that most of that cost escalation was due to upgrade in the F-16.

Ms. Pierrot. I think there is a combination of factors that contributes to the cost increases in the F-16. For example, a model change and the improvement program, have increased the cost.

Senator Johnston. What has been the cost escalation in percentage in real dollars?

Ms. Pierrot. About 11 percent per year for the years 1980 to 1985.

Senator Johnston. As you know, that has been widely criticized by some critics of the Air Force and some critics of the present military buildup as being the result of simply pouring more dollars down the defense pipe and that you just don't get the goods out of the other end other than by cost escalation.

To what extent is that criticism valid or invalid or can you say?

Mr. Hale. I can't answer that question in quantitative terms. I am well aware of the arguments. It goes far beyond the F-16. We saw a sharp cost growth in a number of weapons at the beginning of this administration.

One possible explanation is that the administration was budgeting to the most likely cost. In more recent years, the cost growth has been much more modest, perhaps they budgeted to most likely cost, and we are seeing the results of that.

There is no way to tease out whether or not some of the growth was because, frankly, there was more money available and, therefore, costs went up. I don't know any way to determine that, although it is another possible explanation.

Senator **Johnston**. As I recall, the total cost escalation of the 16 in real terms is something like 60 or 70 percent.

Mr. **Hale**. Eleven percent a year after adjustment for inflation, in 1980 to 1985. So that would be about 70 percent.

VALUE/PERFORMANCE COMPARISON

Senator **Johnston**. Is there no way to make a value judgment, looking at the F-16 now and then, and say this is that much better on a value/performance basis?

Mr. **Hale**. I think it goes back to what some of your colleagues have said. It is hard to assess the value of improved performance. You have to judge what the Soviets have done and what we have done to keep up, as well as the price.

As analysts, we cannot make those judgments. It is a frustrating area to work in for us, as I am sure it is for you, because there are no simple bottom lines of that sort. It is hard to judge whether the buildup was cost effective in general or for particular weapons.

Senator **Johnston**. You are saying one thing that you can say is that when the Air Force says that future costs, future unit costs, will be less, that that is likely not to be so, that the same things that caused this escalation, whatever they were, including the improvements, are likely to be there in the future?

Mr. **Hale**. I think it would be very optimistic to assume substantial declines in unit costs. We are probably going to have another model of the F-16—the F-16F—which would tend to push up unit costs.

COST CONTAINMENT

Senator **Johnston**. When you talk about the advanced fighter, ATF, you say that Congress ought to put a cap on cost, which suggests that we could have put a cap on cost on the F-16, which further suggests that we should not have allowed some of these things to happen, which you now say you can't state whether they were good or bad.

So, how can we, therefore, put a cap on the ATF cost?

Mr. **Hale**. I am not recommending a cost cap. That is not CBO's role and there would be some disadvantages to a cost cap. You will probably hear about them more from subsequent witnesses.

The advantagess, in my mind, would be that it would heighten the visibility costs you would have in the development process. You want to keep cost at a level that permits purchase of a substantial number of aircraft of high quality. My concern would be that in the early development of a plane like this—one that is far off but one that will someday be a top-of-the-line fighter for many years—it is hard to keep costs foremost in the minds of those doing the development. If Congress says, you will not go above a certain level or you will have to tell us, you might heighten visibility. That would be the basis of my suggestion.

Senator **Johnston**. Thank you very much.

Senator **Stevens**. I, too, want to thank you very much again. I would hope that you would see if it is possible to put the F-20 in your computers, as Senator Rudman has suggested, which is a most valuable suggestion.

I want to tell you the clarity of your report makes it speak for itself. I appreciate the work you do. I did read it last evening. I wanted to have a chance to read it before we had testimony from you or from the Air Force concerning the comments.

We thank you both for your help.

Mr. **Hale**. Thank you very much.

SUBMITTED QUESTIONS

Senator **Stevens**. The committee has additional questions from Senators Andrews and Stennis which we will ask you to answer for the Record. They will be inserted at this point.

[The following questions were not asked at the hearing, but were submitted to the Congressional Budget Office for response subsequent to the hearing:]

QUESTIONS SUBMITTED BY SENATOR ANDREWS

TACTICAL COMBAT FORCES

Your study on tactical combat forces for the Air Force show so interesting results with regard to modernizing the F-4 fighter. You results show that upgrading the F-4 will increase the Air Force's t tical force capability potentially by 28%, only 4% lower than if the Congress pursued the administration's program for new fighters.

Q. With Congress now grappling with the budget, is modernizing the F-4 cost-effective as well? What are the savings?

A. **The savings associated with alternative three in the CBO analysis of the Air Force tactical forces, which improves the F-4 and cancels the F-15, vary depending upon which systems would be added to the F-4. If the F-4 were to be reengined, as proposed by Boeing Corporation, the savings for fiscal years 1986 through 1990 would total $6.3 billion of current budget authority in comparison to the costs of the fiscal year 1986 Administration program (as submitted in February 1985). Should the less expensive Air National Guard proposal, which does not reengine the fighter, be adopted, $11.0 billion could be saved.**

Q. Would you recommend this subcommittee take a serious look at modernizing the F-4 because of its value to tactical Air Force capabilit and its cost-effectiveness?

A. **CBO does not make recommendations. The results of the study suggest, however, that this alternative might produce a more effective force than a smaller force which contains a larger percentage of higher capability planes. Thus such product improvement might deserve Congressional attention. It may be of particular interest if, in the face of budget limits, the Air Force is forced to keep F-4s in the inventory well beyond their planned 20-year retirement age.**

QUESTIONS SUBMITTED BY SENATOR STENNIS

F-4 AIRCRAFT MODERNIZATION

Mr. Hale, on table 1 of your statement, you show three alternatives to the Air Force's current plan.

Of the three alternatives, one alternative offers the most dollar savings with the least loss of capability. This option is to slow modernization by improving existing F-4 aircraft.

Your analysis suggests that modernization of the F-4 aircraft is a very cost-effective measure.

Please discuss your work in this area.

Q. How does the modified F-4 compare with the capability of the F-16, F-5, and F-20?

A. Table B-1, page 75, of the CBO study provides a list of the adjusted aircraft systems performance figures for F-16 and F-4 aircraft provided by The Analytic Sciences Corporation. As can be seen there, F-16 scores are, in general, somewhat higher than those attributed to the improved F-4Es that are considered in those study alternatives that modernize F-4 aircraft. Increases in capability for alternatives which modernize F-4 aircraft come about not so much because of unit capability but because of the large numbers of aircraft improved under the alternatives considered. Though not part of the current study, CBO will do an analysis for the Committee comparing the capabilities of the F-20 with other aircraft.

Q. How does the modified F-4 match up against current and future Soviet tactical aircraft?

A. CBO does not have comparable performance numbers for Soviet tactical aircraft because analysis of the balance between forces was not pursued in this study. For any given Soviet threat, however, the analysis would indicate that--according to the TASCFORM model developed for DoD--a larger force containing modified F-4 aircraft would have a higher potential capability than a smaller force containing a larger percentage of F-15s.

PROJECTED COSTS OF AIR FORCE FIVE-YEAR PLAN

Mr. Hale, in your statement you say that the Air Force could nearly meet the basic tactical air goals with the funding in the current five-year plan.

However, also in your statement, you indicate this conclusion is based upon some optimistic estimates of the future cost of new aircraft. The Air Force projects that after adjustment for inflation, F-16 unit procurement costs will be 15% lower in 1990 than they are today, and F-15 unit costs will be 30% lower, despite transition to a new "E" model.

Q. Over the past few years, CBO has done considerable work on the changing costs of weapon systems. Are these Air Force cost projections consistent with your past experience?

A. The Air Force projections of decreases of 15 and 30 percent for the F-16 and F-15 respectively are not consistent with the experience over the past five years for these two aircraft. F-15 and F-16 costs grew by annual real rates of 15 and 11 percent respectively. Nor are these decreases consistent, in general, with past patterns of cost growth for mature aircraft.

Q. What would happen to your analysis, if we assumed that, after adjusting for inflation, aircraft unit procurement costs were the same as current costs? Could the Air Force still nearly meet its three announced goals for tactical air forces?

A If the Air Force did not experience decreases, but instead experienced no real growth in aircraft procurement costs over the next five years, the annual real growth in the costs associated with the fiscal year 1986 program for aircraft procurement and force increases for the Air Force tactical forces would be 5 percent. (This assumes that O&S costs grow by about 3 percent a year in real terms, reflecting historical patterns.) Whether this 5 percent real growth level would be attainable will depend upon decisions the Administration and Congress make over the next five years about real growth allotted to the defense budget as a whole and to this portion of the budget. If the Congress granted real growth of 5 percent a year, the program would nearly meet the goals currently specified, namely attaining 40 wings by 1991, retiring F-4s at about 20 years of age, and modernizing the forces with F-15s and F-16s.

BLANK PAGE

DEPARTMENT OF DEFENSE

Department of the Air Force

STATEMENTS OF:

HON. THOMAS E. COOPER ASSISTANT SECRETARY OF THE AIR FORCE FOR RESEARCH, DEVELOPMENT, AND LOGISTICS

LT. GEN. ROBERT D. RUSS, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

INTRODUCTION OF WITNESSES

Senator Stevens. We will now return to Dr. Cooper and General Russ. We had your testimony previously. If you want to add to your comments, we certainly want to give you a chance to do that, general.

In view of the comments that have been made, do you have any general statements you would like to make or would you like us to proceed with our questions.

Dr. Cooper. Mr. Chairman, I think we need not take time for further statements. We made a statement last time that will suffice.

I would take the opportunity to compliment Mr. Hale on what I think is a very excellent presentation.

I am not quite sure how the committee would like to proceed, but the options and the issues that he brings up in his report and he brought up in his statement are things that we grapple with every time we put a budget together in the Pentagon.

I personally don't take any great exception to the way he went about his report. We might quibble with some of the details.

Also, I think going back to Senator Rudman's point and Senator Garn's point about threat, that really is what drives our program. We are trying to put together a Tactical Force Modernization Program that will be able to match the threat in the 1990's.

UPGRADE PLAN

Senator Stevens. I appreciate that comment. I have always wondered why we didn't have more of a plan to incorporate upgrading into existing airframes and existing technology, rather than replacing the whole system each time we modernize.

The comments that the CBO has made on the F-4 is indicative. There is a lot about the F-4 that has been very good and it has sustained itself very well over a period of time. Yet, as we turn to the F-15 and F-16 and even the F-20, they abandoned that aircraft and we went to a totally different aircraft.

As we look to other nations in the world, they seem to build on successive models of the same kind of system as we did ourselves for a while.

ATF EVOLUTION

Have you given any thought to trying to make the ATF be an outgrowth of one of the systems we are relying on now?

Dr. **Cooper**. If we did that, Senator, of course it would not be the ATF. What I would point out is that is exactly what we are doing with the F-15 and F-16 today.

The F-15 was first introduced into the operational inventory in about the 1975 time period.

The F-16 first became operational in 1980. We started out with both those aircraft with A and B models. Now we are moving to C and D models, and the budget that is before you today requests authority for an F-15E. We are also looking at an F-16F. Those models will carry us well into the 1990's.

In terms of the ATF, we are not looking to introducing that into the operational inventory until 1995, and given the budget climate we face, I think that is optimistic. That is our program.

F-15/F-16 COST INCREASES

Back to the comment Senator Johnston made. There have been cost increases, Senator, in both the F-15 and F-16, but I think we have a very good story to tell there. It is not a cost overrun. There have always been very, very significant capability increases in those airplanes.

I think the program is an intelligent one, because what we are trying to do is squeeze out as much capability as we possibly can in both the F-15 and the F-16 before we move to the next generation fighter which is our ATF. I think that is exactly what we are doing.

Senator **Stevens**. We visited some of those new models, as you know. They are very interesting. Again, I have to tell you my uninformed impression is that we are starting to fold into the F-16 and F-15 some of the innovations that have been thought of in connection with the ATF.

We are putting new avionics into it, new technology, new thrust, new capacity for fuel, the total ECM concept. I am not sure but what some of the ATF classified things are not sneaking into some of these planes.

As a result, we will have a pre-ATF version of the F-15 and F-16 as we go to the ATF. It will really not be the kind of revolutionary plane that we had originally thought of. It will be just the next step in the progression. Meanwhile, it costs a lot to modify the F-15 and F-16.

Dr. **Cooper**. Yes, it does.

ATF COST CONTAINMENT

Senator **Stevens**. Every change you make brings about an increased cost to the original plane. That is one thing that jumped out to me from the CBO study, that really we have to find some ways to keep the costs down on these existing models if we are going to get to the ATF within this century.

Dr. **Cooper**. That is the trade-off we have to make in the Pentagon building. Of course, the alternative to making product improvement to existing airframes is to start a new program. I think that is why we think the program we have is intelligent.

We don't propose to introduce a new airframe until we have gotten as much as we can out of the present generation aircraft.

PRODUCT IMPROVEMENT VERSUS NEW AIRCRAFT

As expensive as it might seem to you to make product improvement in the F-15 and F-16, I want to assure you that occurs at a fraction of the cost of introducing a completely new aircraft in the inventory.

In addition to the procurement cost, you have also to train, establish the logistic bases, and do all the things that go into supporting a new aircraft.

Senator **STEVENS**. Why can't we slide into the ATF period by picking either the F-15 or F-16 and saying it will go forward into the ATF period and not go into an entirely new airframe, entirely new production?

ADVANCED TECHNOLOGY

The thing you are going to get out of ATF is advanced avionics stealth technologies, supersonic speed new engine, greater thrust, longer frames, shorter takeoff, reliability features and ECM. You are cranking these things in now.

Dr. **COOPER**. Not totally.

Senator **STEVENS**. Not totally admittedly because you are not there yet, but if you are cranking them in the F-15 or F-16 or both, it may be that we can crank a little bit more and have an ATF, F-15 and F-16 and never have to go to the new line. That is the big bucks for 1990.

GROWTH POTENTIAL

Dr. **COOPER**. I understand. There is only so much growth that is available in both an F-15 and F-16. That is more or less a frozen design. We can make modest changes to it. We certainly can make changes to the avionics packages and to the weapons that it carries.

In terms of the capability that the ATF will give us, that cannot be grown out of an F-15 or an F-16. If it could, there is no reason we should build an ATF. Let me assure you it can't.

ATF RELATED TECHNOLOGY

Senator **STEVENS**. We have a $222 million request plus or minus some other things in ATF. We have $170 million for ATF-related technology to go into existing aircraft. So, ATF-related technology for existing aircraft is almost as great as the ATF budget, itself. Now, that is splitting your dollars.

In my judgment, you will not get the ATF in this century.

Dr. **COOPER**. Of course, that goes back to the growth we have in our budget and Mr. Hale's point is well taken. We believe if the growth is sustained at the levels we have projected, that we will be able to get to an ATF.

BUDGET REALITIES

Senator STEVENS. That goes to what is going out here on the floor. I have told the people I am not going to vote for a zero real growth defense budget. There are a lot of people who say they won't vote for it unless it is zero growth.

Somewhere someone has to recognize the problem of meeting with the House. The House has a minimum, it is really a negative real growth budget over there. If those two are going to blend at somewhere near zero, we have to start up above zero. They are not recognizing that in terms of the things that go on the floor.

I hope we can revisit the budget we lost by two votes rather than automatically assume we can pick up two or three votes to make things fly. It means all of the rest of us have to support real growth going in.

If we support zero real growth going in, in the Senate we will have negative 2½- to 3-percent real growth in defense and you kiss the ATF and the improvement program goodby.

I think some people better get this in perspective. It means shutting down a lot of lines on existing aircraft if we go to a negative real growth in 1986.

Dr. COOPER. I assure you, Senator, if that occurs, we will go back to the drawing board, and the options presented here today will all be looked at again.

F-15E VERSUS F-16F PRIORITY

Senator STEVENS. The Air Force wants to begin production of the dual role F-15E next year and work toward an F-16F derivative by the last part of this decade. This is sort of splitting off the last comment I made.

Which one of those is the highest priority?

Dr. COOPER. The F-15E without a doubt, Senator.

Senator STEVENS. How do you rate that against the ATF, F-16 derivative, F-15 derivative, and ATA dollar?

General RUSS. In the current year the F-15E is the most important in the tactical program.

Senator STEVENS. I appreciate that. That is the most direct answer I have had all year.

[Prepared comments of General Russ follow:]

PREPARED COMMENTS OF LT. GEN. ROBERT D. RUSS

DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

As shown on slide 1, the CBO report concludes the Air Force will ..."meet its three major goals -- building to 40 wings, modernizing with F-15 and F-16 aircraft, and retiring old F-4 aircraft -- if there are real increases of 2 to 7 percent a year through 1990 in budget authority for tactical aircraft." I support this conclusion and the further conclusion that if funding is not available, then modernization can be slowed, growth can be slowed, or some combination or growth and modernization must be delayed. However, I have some concerns with some options developed in the CBO report. Specifically, I do not believe it useful to use snapshot cost figures to determine historical trends nor do I consider it prudent to rely on the F-4 as a primary force structure weapon system through the 1990's, as proposed in the CBO options.

Concerning long term affordability to include ATF, again the CBO findings are realistic i.e., the Roadmap including ATF is affordable if: ATF costs remain less than 1.6 times the F-15; a minimum of three percent budget growth is experienced; and the F-16 cost growth is limited (Fig 2). The Air Force has recognized these issues and senior leadership is taking positive action regarding the ATF. The Air Force also has investigated long term affordability using assumptions based on historical data and precedence. Shown in Fig 3 is a Fighter Procurement Funding Band which represents the average high and low historic limits (as a percentage of Air Force TOA) within which the Air Force has provided TOA for fighter procurement. The line running through this band, labelled "40 Wings" represents the forecast budget requirement necessary to procure the Roadmap aircraft quantities and types, to include F-15C/D/E, F-16C/D/F and ATF. As can be seen the total procurement funding requirement tracks the historic Air Force low limit until approximatley 1994 when the ATF is introduced in quantity. It then rises above the historic low for several years, but in fact never approaches the historic average high limit. This particular funding band was developed assuming a three percent budget growth and it should be noted that even with zero growth (which could be represented by horizontal limit lines), the Roadmap would be considered affordable when measured against the historic average limits.

Fig 4 illustrates another option which provides a 40 wing force but allows the force average age to increase to 11 years vs the desired 10 years. This would require a stabilized procurement of 242 fighters per year instead of the 260 per year on the previous chart. This option represents an even more favorable affordability situation.

In summary the Air Force believes the general CBO conclusions have captured a realistic perspective of our plans and options. Furthermore our internal studies, based on historic trends and limits, indicate that the ATF can be managed to affordable cost levels.

TACTICAL FIGHTER ROADMAP

CBO REPORT CONCLUDES THE AIR FORCE WILL...

> "MEET ITS THREE MAJOR GOALS -- BUILDING TO 40 WINGS, MODERNIZING WITH F-15 AND F-16 AIRCRAFT, AND RETIRING OLD F-4 AIRCRAFT -- IF THERE ARE REAL INCREASES OF 2 TO 7 PERCENT A YEAR THROUGH 1990 IN BUDGET AUTHORITY FOR TACTICAL AIRCRAFT."

IF FUNDING NOT AVAILABLE OPTIONS INCLUDE:

- SLOW MODERNIZATION
- CURTAIL GROWTH
- SLOW MODERNIZATION AND CURTAIL GROWTH

FIGURE 1

ADVANCED TACTICAL FIGHTER

CBO ANALYSIS INDICATES TACTICAL FORCE CAN GROW TO 40 TACTICAL FIGHTER WINGS IF...

- ATF COSTS LESS THAN 1.6 TIMES THE F-15
- THREE PERCENT REAL BUDGET GROWTH EXPERIENCED
- F-16 PROGRAM EXPERIENCES NO GROWTH

FIGURE 2

FIGHTER ROADMAP PROCUREMENT
(3% GROWTH)

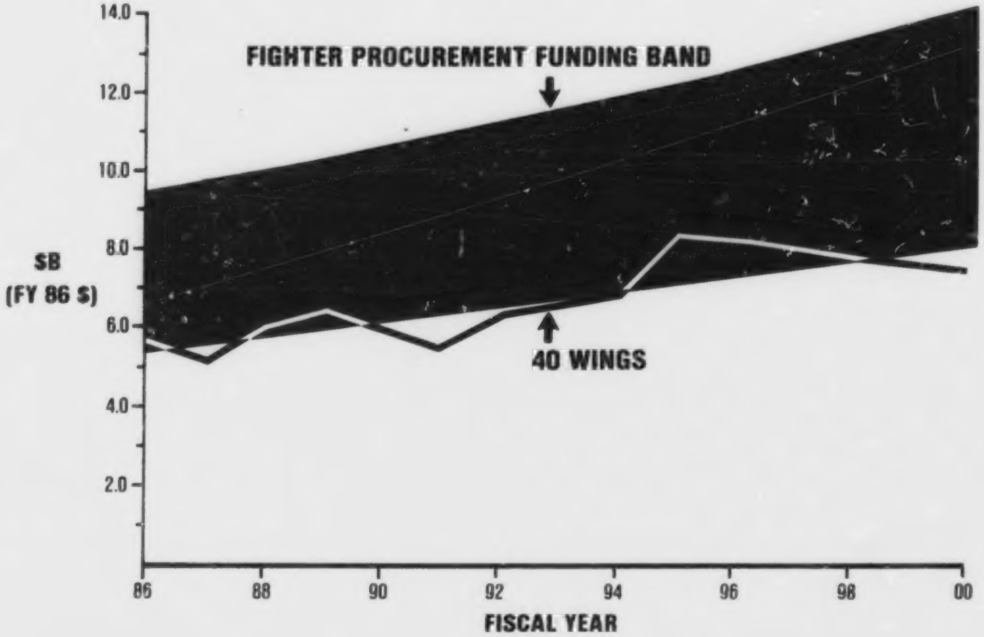


Figure 3

FIGHTER ROADMAP PROCUREMENT
(3% GROWTH)

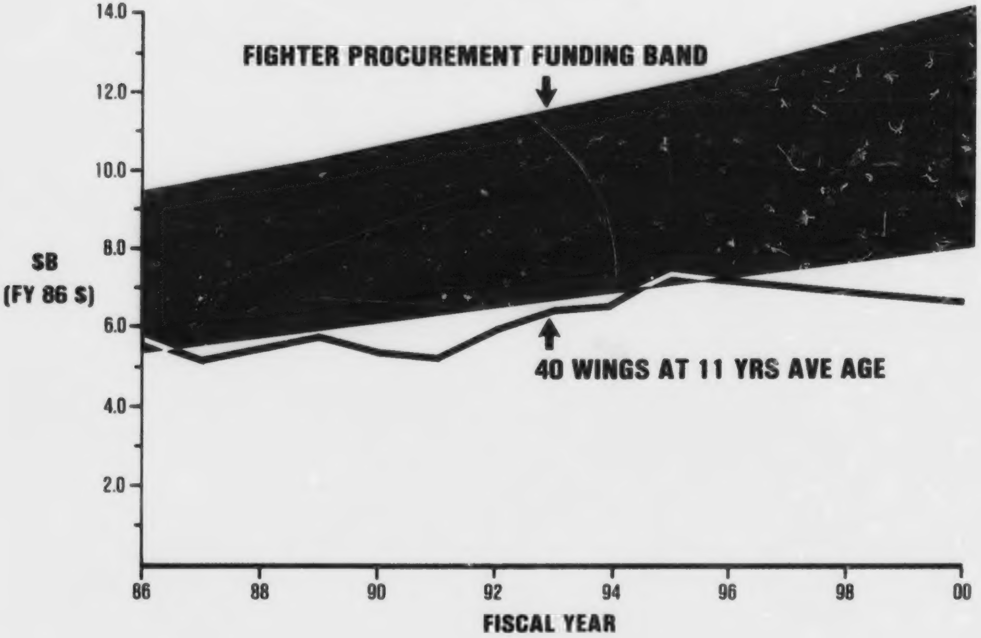


Figure 4

AGING OF THE FORCE

Dr. **Cooper**. I would like to make another comment. It is a very complex subject. There are many variables you have to trade off. Really in our mind it is not an either/or situation, ATF or improving the current generation aircraft.

We would, obviously, like to have ATF in the 1995 timeframe; if not then, then the year 2000. At some point we will have to replace current generation aircraft. In the meantime, the aircraft that we are currently fielding, those that we are buying today, are going to be in the inventory for probably 20 more years.

So, we do have to have a balance between introducing a new aircraft and improving those that are currently in the inventory. That is the balancing act we go through.

Senator **Stevens**. That is what I told your people out there in California, we ought to go for the gold now because as much as we can push ATF in these derivatives, F-15 and F-16, we will have the use of them until the end of the century.

If we wait until 1990 to do that, we might well have countermeasures so developed and fielded they would be immaterial anyway.

I urge you to push the ATF into the F-15's and F-16's. I think that is the right direction. I really do.

Senator **Rudman**. Thank you, Mr. Chairman.

General Russ, I like your answer to Senator Stevens. I will send you a list of 100 true and false questions and if you will just check the appropriate box, it would certainly make our markup a great deal easier.

General **Russ**. As long as you have a "maybe" block.

AMRAAM

Senator **Rudman**. I only have one question. We have discussed this issue and it has been aired very well this morning. I want to come back to the issue we talked about at the last hearing you attended dealing with the critical need for a beyond visual range air-to-air missile.

Obviously, all of these things that we are talking about are just platforms to launch something from. That is critical. I would rather have an F-4 with a long-range air-to-air missile that worked than an ATF with one that didn't.

My question is: What kind of backup do you have to the AMRAAM program?

I know there is some talk about improvements in Sparrow, and so forth. How are we doing?

I am still not totally satisfied with the answer we got at the last hearing about AMRAAM from a number of points of view. I wonder if you would comment on that. That is a key question as we discuss the whole question of aircraft.

Dr. **Cooper**. What we are talking about here is the next generation radar-guided missile that will follow the Sparrow missile or current generation beyond visual range missile.

In the next 5 years, and, of course, that is subject to what the budgets are, but right now if you look in the Air Force and Navy budgets for the next 5 years, you will find about $100 billion budgeted for air defense related things, primarily aircraft.

What we are talking about in the AMRAAM program is a missile that I think greatly leverages that $100 billion investment. We just completed, as you probably know, a very intensive 4-month review to try to bring the cost of the AMRAAM down. In January when we presented our budget, it was $8.4 million and 17,000 missiles.

We now estimate we can do that same program for $7.5 billion. The reason we brought that down is Secretary Weinberger took a wire brush to us and told us to get it down or the program is going out. That was the long and short of it.

SURVIVABILITY

If you think about that, 7½ percent to leverage a $100 billion investment is a pretty good investment. We have all those shiny bows on the runway right now. We need the next generation arrow to go in those bows. AMRAAM is that. It is an active missile. You can launch it and it will lock on, and you can leave.

The key to that is survivability; you don't get shot in the process of shooting the other guy.

Senator **Rudman**. It also engages multiple targets.

Dr. **Cooper**. Yes; more important for us, I think is that it goes on the F-16. That goes back to the improvements we are trying to make to the current generation force. The F-16 today does not have a radar-guided missile. It has a within visual range only capability, and it is a superb aircraft in that role.

But the leverage the AMRAAM will give you when you put it with the F-16 to give the F-16 beyond visual range capability is tremendous.

IMPROVED SPARROW

Senator **Rudman**. I am informed that there are things that can be done to the present version of the Sparrow that will improve it vastly, and will give it much, but not all, of the capability that we have with an AMRAAM.

Dr. **Cooper**. I will be happy to talk about that. It is one of the alternatives we looked at if we canceled AMRAAM. The fundamental difference between a Sparrow and an AMRAAM is in two areas.

One is size. The Sparrow is a 510-pound missile. At the most you can only load two of those on an F-16, because the two outer wing stations are not stressed to take a missile of that size.

So, the Sparrow has problems interfacing with the F-16. That is critical to the Air Force because we want to put a radar missile on the F-16.

The second thing is that Sparrow is a semi-active missile which means it does not have launch-and-leave capability. It is radar guided. It guides from the radar energy that emanates from the aircraft.

If this is the end of an aircraft and I launch my Sparrow, I have to continue to drive it until that Sparrow actually strikes the target because its guidance comes from the host aircraft.

With an AMRAAM, what we have been able to do because of micro miniaturization is put the radar in the front end of the missile, and as soon as it is launched, the aircraft can break off and attack other targets, or do other things.

The bottom line is that it is more capable and is more survivable.

Senator **Rudman**. You can also launch another missile?

Dr. **Cooper**. Up to [deleted]. That is the capability that the Navy has today with the Phoenix. Of course, the Phoenix weighs over 1,000 pounds.

Senator **Rudman**. There are things being looked at on the Sparrow that will give it more of the capabilities that the AMRAAM has. I am not suggesting it is a substitute, but it is something that has to be looked at in terms of budget constraint.

Dr. **Cooper**. Yes, sir; we did. The Sparrow is an 8-inch missile; AMRAAM is a 7-inch missile. From the point of view of packing electronics, that is good, you have more volume.

If you want to make an AMRAAM out of the Sparrow, you could do that, but it would take about 3 years longer to bring it on line and would probably cost about one-half of a billion dollars more to do it, and you would still end up with a 500-pound missile.

Senator **Rudman**. Thank you.

Thank you, Mr. Chairman.

Senator **Stevens**. Thank you.

We have a vote on. I think we can turn to Senator Sasser before we all go and then return.

Senator **Sasser**. I have just a couple very quick questions, Mr. Chairman.

B-1 WEAPONS LOADER

Secretary Cooper, during the last hearing I brought up the matter of attending the reprogramming of the new B-1 weapons loader. That reprogramming at that time had not been approved by the House.

What is the status of the reprogramming in the House now?

Dr. **Cooper**. I don't believe they have taken it up unless they took it up late last night. They had a series of reprogrammings on the docket last night. I am told the munitions loader was not one of those. It is our best understanding they will take up the reprogramming on May 13, 1985.

Senator **Sasser**. Has Secretary Taft or Secretary Weinberger expressed the Air Force's concern on this matter to the House committee.

Dr. **Cooper**. I believe Secretary Taft has spoken with Chairman Aspin on the matter.

Senator **Sasser**. I hope the Air Force will continue to pursue this matter. We have a situation here where the Air Force has done what Congress urged you to do and that is go out for competition on this particular system.

You bought or attempted to buy one that came in from the lowest bidder. That is precisely what we have been urging you to do for some time. I hope you will stay on this and make sure that the House committee goes forward with this reprogramming.

Dr. Cooper. Let me assure you that we will stay on it. I think there is a procedural matter involved here. We have a formal source selection, and it was run as fair as we know how to run it. There was a clear winner.

We proposed that to the Congress. Unfortunately, it is out of our hands at this point. We made our case. We had a 2½-hour hearing before the House Armed Services Committee, so they certainly understand our point of view on it. I hope they will support us.

Senator Sasser. Keep the heat on.

Dr. Cooper. Thank you, Mr. Chairman.

Senator Stevens. Senator Andrews.

Senator Andrews. Thank you, Mr. Chairman.

BOMB EJECTOR RACK

Knowing that the Air Force witnesses at the last Air Force procurement hearing were given no time to answer questions before the subcommittee, would you want to clarify your strategy for procurement of the new technology bomb range ejector unit?

General Russ. Sir, I can comment on that.

Senator Andrews. You can expand for the record, but a brief comment will be helpful.

General Russ. We will.

[The statement follows:]

Statement Attributable to Maj. Gen. George L. Monahan, Jr.

This statement is attributable to Major General George L. Monahan, Jr.:

I welcome this opportunity to clarify Air Force strategy for procurement of new technology bomb rack ejector units. I'd like to review briefly the actions which led to the current competition, and then discuss in more detail how the competition is structured and how we will select the ejector units.

Currently, our fighter aircraft carry most munitions on multiposition bomb racks which are loaded onto the aircraft and then loaded with munitions. Each weapon position on these racks requires an ejector unit to releases the bomb from the aircraft. Current racks and ejectors have some operational and logistical performance characteristics which must be improved in new procurements. For example, current ejector units require cleaning after each mission. To correct this and other undesirable characteristics, the Department of Defense published Military Standard 2088 (MIL-STD-2088). This document provides general design criteria for bomb racks and ejector units and includes criteria for all services.

We are now in the process of selecting ejector units for the F-15E. In accordance with Department of Defense policy to eliminate overspecification, the Air Force developed specifications for this procurement which include the minimum MIL-STD-2088 criteria necessary for the F-15 and F-16. For example, we specified that the units be used 100 times between cleanings. Since these ejector units must be integrated into permanent F-15 weapons stations, the Air Force has requested McDonnell Douglas Corporation, the prime contractor for the F-15, to conduct a competitive source selection using the Air Force specifications. McDonnell Douglas issued a request for proposal (RFP) on April 9, 1985.

One aspect of this competition is the requirement to evaluate two alternatives. Both alternatives require ejector units with significant operational and logistics improvements not found on ejectors currently on Air Force fighters. The specifications for the first alternative include all Air Force minimum requirements. The specifications for the second alternative include additional improvements which are highly desirable, and which may lower life cycle costs. Competitors may bid on either or both of these alternatives. McDonnell Douglas will evaluate cost and technical proposals and select a winner for each alternative. Without naming the winners, McDonnell Douglas will present cost and technical results to the Air Force. The Air Force will review the data and select an alternative based on performance, life cycle costs, and supportability considerations. We believe this approach will ensure maximum competition and an excellent opportunity to trade off cost, performance, and supportability to provide the most cost effective decision.

NORTH DAKOTA—NEW YORK CONTROVERSY

Senator **Stevens**. Is this the North Dakota, New York controversy?

Senator **Andrews**. It is not a North Dakota-New York controversy. It is trying to get down to the point where, as General Russ said, the stuff you put on the plane, you would rather have old platforms and stuff gets ejected properly than a new platform with all the ejectors and quality equipment hanging down there.

Senator **Stevens**. Of course, the Senator is going to ask the question as he is entitled to do, but I wish you could tell me who we can put in the room to get an answer to it so that we don't have a prolonged internecine battle during markup.

Senator **Andrews**. The chairman will come down on the side of just righteousness.

Senator **Stevens**. I can be Solomon, too, and cut the baby in half.

General **Russ**. What we are going to do is compete the requirement for our ejector racks. Our ejector racks are equipment that fit on the airplane and that drops the bombs.

You recall the problems associated with the coffee pot on the C-5 and the fact it was overspeced. We have designed a spec for this ejector rack. Then we have looked at it very closely because of the results of some of our overspecing.

We have taken some of the things out that we think are nice to have. Now we have a spec which is a minimum spec and we have another spec that we would like to have if we could get it for a reasonable price.

What we are doing is that we are going out and competing and we are asking the contractors to come in and bid on both the full spec and bid on the one that is the reduced spec. We have to have some ejector racks with the full spec because of the way they fit on the airplane.

BOMB EJECTOR PROCUREMENT FOR F-15E

Senator **Andrews**. Along with that can you explain to the subcommittee how the procurement of the bomb ejector unit technology will be using state of the art technology for the F-15E?

I hope you are not trying to get some substandard thing.

General **Russ**. No, we are not trying to get something substandard. We are trying to get the least cost thing we can get to do the job. We believe that maybe all of one type of rack would be the least expensive or maybe half of one type of rack and half of a lesser spec rack would do the job. We don't know that.

We will know in July after the competiton is concluded and we receive the bids and we find out which is the low bidder.

Senator **Andrews**. Don't you want the best you can get and couple that with standardization so that you don't have four planes standing alongside three other planes with different bomb racks on them?

General **Russ**. If money were no object, we would like to have them all with the full capability. However, in terms of tight budgets, we look at it and we don't want to be accused of overspecing the requirement for our ejector units.

So, we can get by with something less on about 50 percent of the units. That is what we are trying to do. It is a matter of whether we do something manually, screwing down a screw on the side of the ejector rack to tighten on the bombs, if we do it manually or we do it automatically.

It is a few seconds more to do it manually, but if it is cheaper to do it that way——

Senator **ANDREWS**. What you are looking for and what you will assure this committee, you are looking for the most cost-effective technology you can get.

General **RUSS**. Absolutely.

Senator **ANDREWS**. And whatever you do we can depend on the fact that you are going to be reacting to that cost-effective technology?

General **RUSS**. Absolutely.

Senator **ANDREWS**. Thank you, Mr. Chairman.

I have a number of questions that I would like to put in the record.

Senator **STEVENS**. Thank you very much.

May I inquire, does the staff know any Senator who intends to come back after this vote?

I don't believe so.

I think we are going to have a series of votes over there. I have asked my questions. I have a series of technical questions in this area for the record. We will submit them in the normal course.

I do thank you for coming back. If you have any further comments you want to give us about that CBO report, why we will be pleased to have them. I think they are straightforward and they presented to us some of the options.

F-16 COST CHARTS

Dr. **COOPER**. Senator, we would like to put a couple of charts in the record if we could and in addition, I would like to request permission to insert some information on F-16 costs. The last time that we appeared before you, you asked the question about the contract value having gone up in excess of $3 billion. We would like to explain that.

[The information follows:]

F-16 COSTS

The first chart shows the savings achieved by the F-16 FY82-85 multiyear procurement. Comparing the contractor's proposal for annual procurements ($3.08 billion) and the multiyear proposal ($2.82 billion) shows the savings of $260 million. The price of the multiyear contract was reduced another $166 million during the contract negotiation.

The second chart shows that the increase in the multiyear contract value results from added tasks not cost growth. These efforts could have been procured on separate contracts but were added to the multiyear contract as a matter of administrative convenience. The 54 USAF aircraft were annual buys of additional aircraft as the result of FY84 Congressional budget action, and the $0.17 billion for the the Egyptian aircraft are Egyptian funds. The procurement of avionics intermediate shops and the support and training equipment were efforts orginally budgeted for but not negotiated with the original multiyear contract. These are separately defined efforts and do not represent a cost increase for work previously negotiated.

F-16 FY82-85 MULTIYEAR

(480 AIRCRAFT)

		SAVINGS
ANNUAL PRICE	3.08	
MULTIYEAR PRICE	2.82	.26
NEGOTIATED MULTIYEAR	2.66	.16

BLANK PAGE

BLANK PAGE

BLANK PAGE

F-16 FY82-85 MULTIYEAR

(TY$, BILLIONS)

ORIGINAL CONTRACT VALUE (480 AIRCRAFT)		2.66
ADDITIONS TO CONTRACT		+.75
54 USAF AIRCRAFT	(.26)	
40 EGYPTIAN AIRCRAFT	(.17)	
14 AVIONICS INTERMEDIATE SHOPS	(.17)	
SUPPORT & TRAINING EQUIPMENT	(.15)	
PRESENT CONTRACT VALUE		3.41

SAR REPORTS

Dr. Cooper. We also would like to explain the increase in the SAR report. They are really very good stories, sir.

Senator Stevens. All right. We will be glad to have them. We will put them in the record. I look forward to hearing them, myself.

[The information follows:]

SAR COSTS

This chart, "F-16 Selected Acquisition Report," outlines the major funding changes in the F-16 program between the Sept 84 SAR and the Dec 84 SAR (which reflects the FY86 President's Budget).

The addition of 144 aircraft is the net results of reducing the procurement rate by 36 aircraft in both FY86 and FY87 and the addition of 216 aircraft in to be procured in FY93. The Sept SAR included procurement only through FY92.

The FY86 President's Budget also added funds to develop a variant of the F-16, the F-16F, and the delta procurement cost for 364 aircraft to be produced in this configuration starting in FY89.

The changes in engine costs are offsetting. The increase reflects the delta procurement cost for improved performance engines (IPE) scheduled for production incorporation in 1990. The IPE will provide higher thrust and in turn better aircraft performance to meet the improving threat in the 1990's. The decrease is associated with the recently competed alternate fighter engines scheduled for production incorporation in aircraft delivered in mid 1986. The cost reduction is based on the results of the competition which yielded lower engine costs than orginally anticipated.

The following charts track the F-16 flyaway and program unit costs associated with the President's Budget submissions for FY83 through FY86. The first chart in constant year FY85 dollars shows that on a unit basis the cost of the F-16 has been decreasing. There is a slight increase in the Dec 84 numbers which is caused by the delta cost for the F-16F. If the F-16F delta is deleted (i.e. if we procured the same configuration aircraft reported in the earlier SARs), the decreasing cost trend continues.

The second unit cost chart presents the same data but in then year dollars.

BEST COP

F-16 SELECTED ACQUISITION REPORT

	TY $ (BILLIONS)	AIRCRAFT
SAR, SEP 84	49.9	2651
FY 93 BUY OF 144 AIRCRAFT ADDED	+ 3.4	144
F-16F PROGRAM ADDED	+ 3.5	
HIGHER THRUST ENGINE	+ .5	
ENGINE COMPETITION REDUCTION (AFE)	– .5	
SAR, DEC 84	56.8	2795

F-16 SAR UNIT COSTS
(CONSTANT FY 1985 $ IN MILLIONS)

COST	DEC 81	DEC 82	DEC 83	DEC 84	*
QUANTITY	1985	2165	2651	2795	
RECURRING FLYAWAY	13.1	13.3	12.2	12.6	(11.9)
PROGRAM	19.1	18.5	17.1	17.7	(16.8)

* FIGURES IN PARENTHESIS EXCLUDE THE F-16F

43-738 O—86——14

F-16 SAR UNIT COSTS
THEN YEAR $ IN MILLIONS

COST	DEC 81	DEC 82	DEC 83	DEC 84	*
QUANTITY	1985	2165	2651	2795	
RECURRING FLYAWAY	14.6	14.9	13.9	15.1	(14.2)
PROCUREMENT	19.6	19.5	18.3	19.6	(18.6)
PROGRAM	20.5	20.0	18.7	20.3	(19.0)

* FIGURES IN PARENTHESIS EXCLUDE THE F-16F

F-100/F110 IMPROVEMENT PLAN

Dr. COOPER. One other point I would like to make is that we received authority last night from the Secretary of Defense to go forward with our higher thrust improvement plan on both the F-100 and F-110 engine. It is exactly as I described to you at the last hearing. So, we are very pleased with that.

Senator STEVENS. Good. That is good news.

Thank you very much for your help.

SUBMITTED QUESTIONS

The committee has a number of questions which we will submit for your response.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

ADDITIONAL COMMITTEE QUESTIONS

ANALYSIS OF CBO REPORT

QUESTION: The CBO study indicates that a large force yields more capability than a small one even if it contains fewer top-of-the-line aircraft. The Air Force, on the other hard, when forced to choose between a larger force or a smaller one with a higher percentage of top-of-the-line aircraft, has consistently chosen the smaller force. If you do not concur with the CBO analysis could you share with the Committee your analysis that supports your approach?

ANSWER: Air Force analysis of force structure planning is a comprehensive, intensive effort continually conducted by HQ USAF and the Tactical Air Force Commands. This analysis considers many factors not included in the CBO report. One primary characteristic not contained in the CBO study is to "compete" various force structure options against potential threat forces arrayed in the various theaters. This provides us with our overall recommendations for the high-low force mix in the constraints of a limited budget. In general, key critical capabilities such as all weather air superiority fighters and day/night adverse weather interdiction aircraft have a high payoff in combat capability when modeled against potential enemy forces. Our analysis has lead us to a balanced approach to force structure planning. Substantial growth for the Tactical Air Forces has been achieved in addition to the inclusion of the required, high quality force capabilities.

SMALLER FORCE

QUESTION: According to the CBO study a continuation of historical trends in cost increases, combined with other assumptions based on history, could yield a force significantly smaller than today's when the ATF comprises a large share of the force. What assurances can you give the Committee that this situation will not occur assuming a future average funding profile comparable to the average funding profile that we experienced over the past 20 years?

ANSWER: The CBO study chose the snapshot comparison of FY 80 vs FY 85 as their measure of "historical trends". For a number of reasons the Air Force feels the period FY 80-85 was not a historical norm and thinks it important to take a broader perspective of actual historic cost trends. Figures 1,2 and 3, which show actual historic costs for the F-4, F-15 and F-16, provide a graphic representation of actual historic trends. In each case, for a given model and configuration, unit costs decrease as aircraft quantities increase. In fact for the F-15C/D and F-4D/E the unit costs actually decreased below those of their previous models despite major increases in capability. These cost decreases have been demonstrated in all recent Air Force fighters and are considered more representative historic trends.

(The Figures follow:)

FIGURE 1

UNIT FLYAWAY COST COMPARISON
FY 86 $

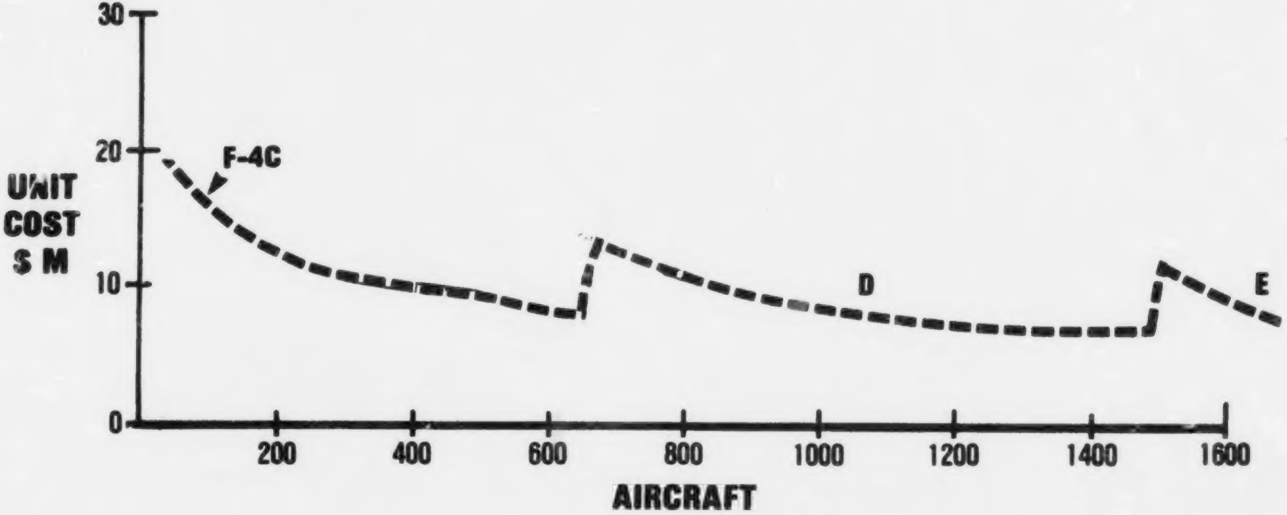


FIGURE 2

F-16 UNIT COST COMPARISON

FY 86 $

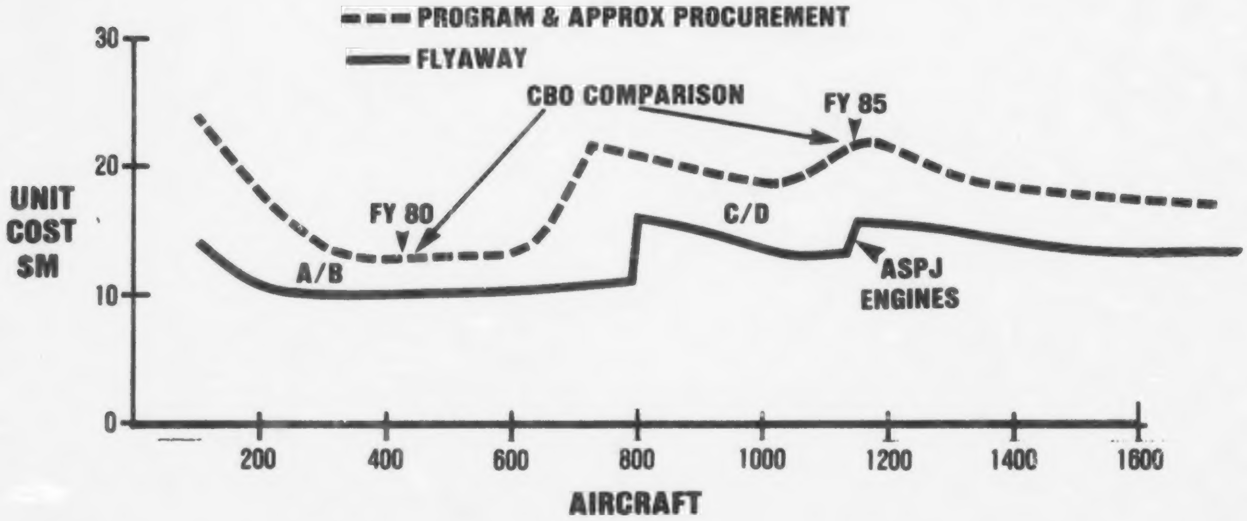
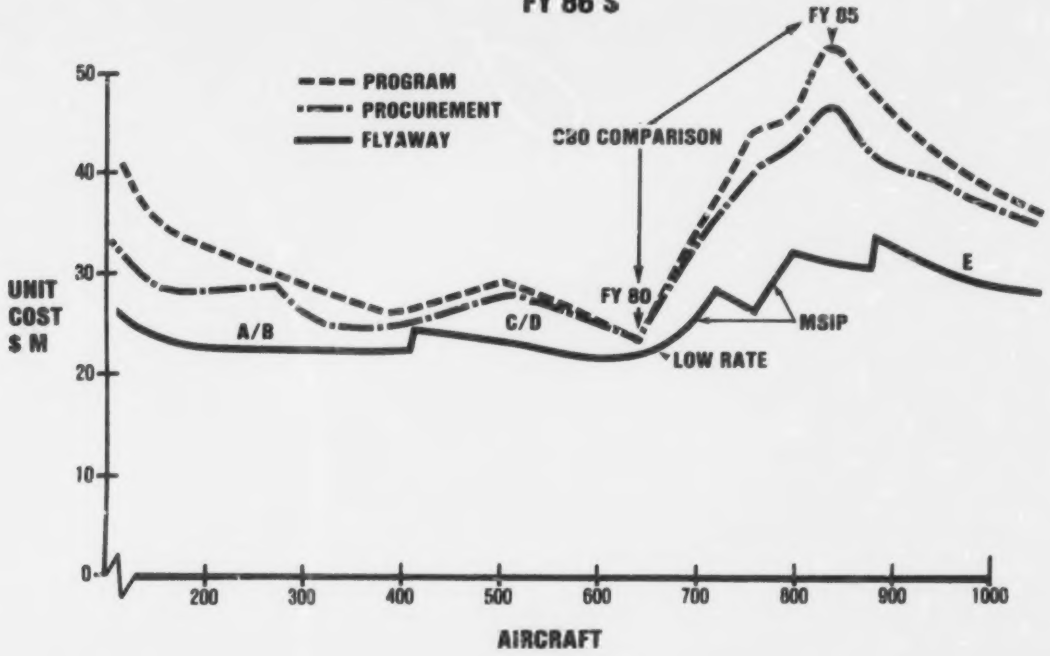


Figure 3

F-15 UNIT COST COMPARISON
FY 86 $



In the CBO study, unit cost comparisons were made between two selected snapshot procurement years, FY 80 and FY 85. Unit costs shown for F-15 and F-16 in 1980 represent all time low unit costs. In the five years following 1980, not only were production rates decreasing and unstable, but the F-16C model was introduced, major update programs - Multi-Staged and Multi-National Staged Improvement Programs (MSIP) were begun, new engines were incorporated, new radars were installed, shortfalls created by Congressionally directed cuts to support equipment in FY 83/84 were added to the FY 85 budget and development of the F-15E begun. As a result the 1985 unit costs for both F-15 and F-16 are at an all time high, however the configurations have reached a stable point and production rates are increasing. The Air Force fully expects that previously demonstrated historic trends will now emerge and unit costs will decrease throughout the FYDP.

The Air Force has used these trends and examined the total Roadmap affordability through the year 2000. This examination considered a 40 wing force with an appropriate mix of ATF aircraft. The results indicate, as concurred with by the CBO study, that the 40 wing Fighter Roadmap plan is affordable with as little as a budget increase averaging 2%. In the case of 2% average increase the Roadmap could be accomplished without rearranging internal budget priorities. However, if budgetary constraints were more severe, studies indicate that even with continued zero budget growth the Roadmap is still affordable, requiring some change in budget priorities in the 1990's, but not beyond previous historic high percentages of AF TOA devoted to fighter procurement. Overall the Air Force continues to support the Roadmap as an affordable procurement strategy which will provide the tactical fighter forces required to meet our national military objectives.

COST OF ATF

QUESTION: The results of the CBO study differ from a study done by the Air Force on ATF affordability. The Air Force study assumes that the cost of an ATF would be 60 percent higher than that of an F-15; the CBO study indicates that F-15 costs were three times those of an F-4. What is the Air Force doing to insure that history does not repeat itself?

ANSWER: While the Air Force agrees with the overall results of the CBO study, there are specific areas of concern where incorrect facts and assumptions have led to improper conclusions. Chief among the areas of concern is the CBO treatment of cost comparisons and the affordability conclusions drawn from these comparisons.

Specifically, CBO chose to compare the multi-mission F-4 with the specialized air-to-air F-15. Using historical data the attached "Unit Flyaway cost Comparison", Fig 4, shows F-15 vs F-4 costs and demonstrates the CBO comparison point at the end of first year procurement which we consider an invalid comparison. In this situation a correct comparison might be at equivalent procurement quantities such as the F-15 at #335 vs F-4 #335.

However, the Air Force position is that a more proper comparison is actually the F-4 vs F-16. The F-16 was designed as a multi-mission air-to-ground and air-to-air aircraft and is the aircraft replacing the F-4 in our inventory. "Unit Flyaway Cost Comparison", Fig 5, shows F-16 vs F-4. In this comparison, costs range from a 45% more expensive F-4 to a 100% more expensive F-16, but over current total production quantities average about 30% more expensive for the F-16.

Figure 4

UNIT FLYAWAY COST COMPARISON
FY 86 $

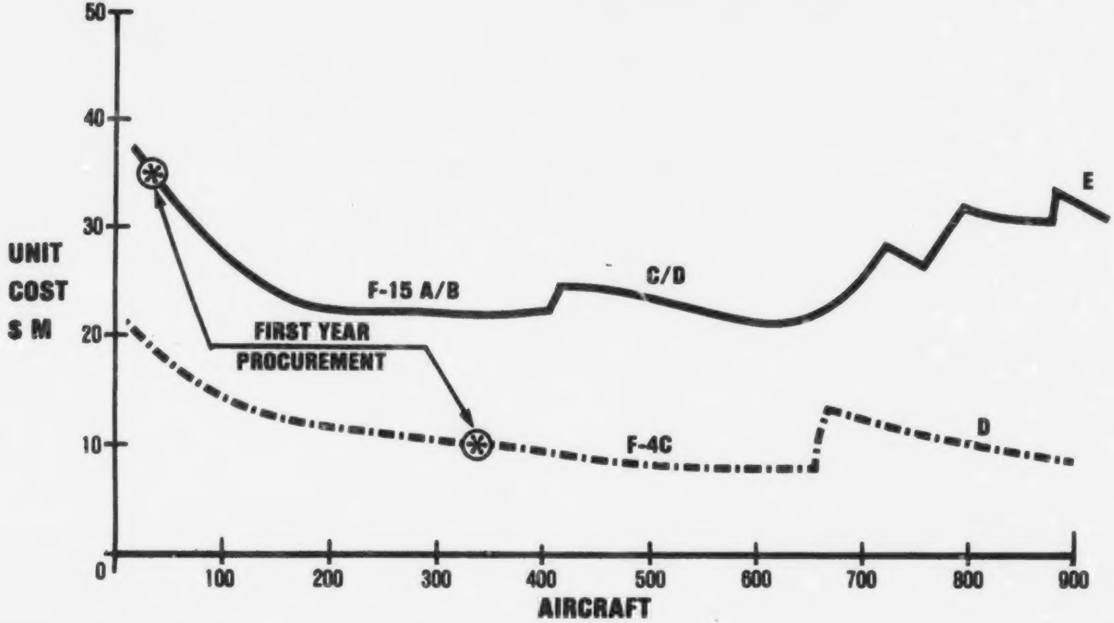
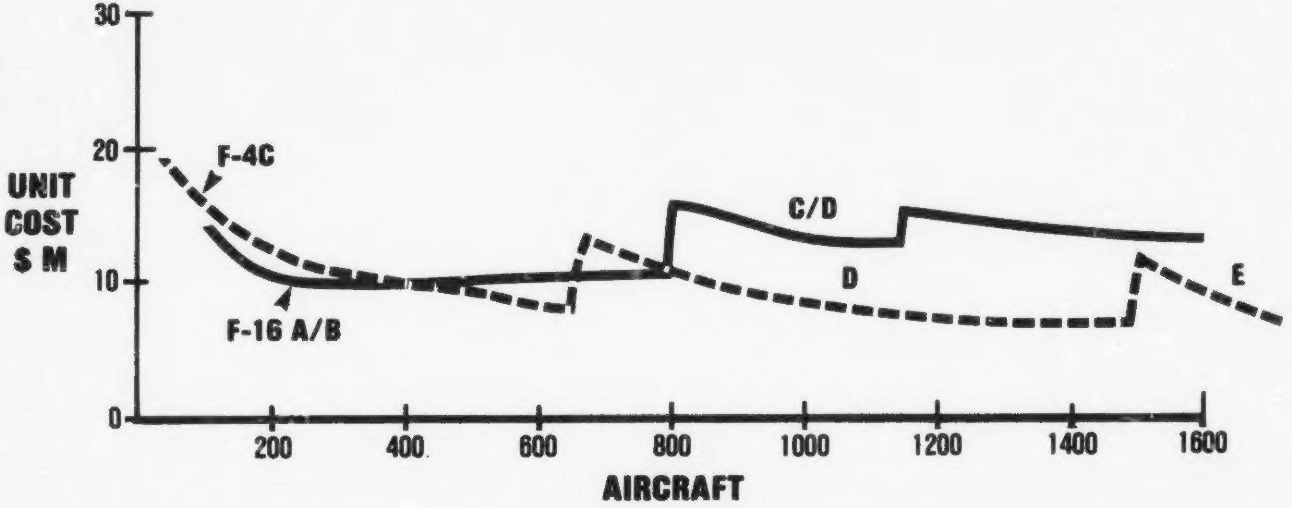


FIGURE 5

UNIT FLYAWAY COST COMPARISON
FY 86 $



Therefore, when comparing the cost of the ATF with its predecessor the F-15, the Air Force does wish history would repeat itself. However, in planning for affordability the Air Force developed ATF cost goal is a much more pessimistic objective and in fact represents a 60% increase over the most recent specialized air-to-air aircraft, the F-15.

It is also important to note that the CBO only observed the ATF program during the initial phase. That phase consisted of determining, through contractor proposals, what technologies were available and could feasibly be applied to the air-to-air mission. These proposals were constrained primarily by technology availability with cost a secondary consideration. The next step, which the CBO was unable to review, is a determination of what is affordable and then a management emphasis on cost goals and containment while achieving integration of the selected technologies. The Air Force is just beginning this second phase; affordability goals are being discussed, and internal cost caps are being examined. These actions are taking place at senior Air Force management levels with proper emphasis being provided to capability, force structure and affordability. Senior Air Force management will take action in the near future to specifically establish affordability restrictions on the ATF, however this must not be done until all impacts are known and considered.

ANNUAL REAL GROWTH

QUESTION: CBO's assessment is that an annual real growth of up to 7 percent will be required to follow the fighter roadmap. Given the bleak prospects for future budget growth, do you think this roadmap is still realistic?

ANSWER: The CBO study actually states the DoD Tactical Fighter Roadmap plan "...would require roughly a two percent real increase...in each year after 1985." An important assumption the CBO study failed to recognize was Air Force's ability to realign priorities and restructure the percentage of dollars available for fighter procurement. Current Air Force plans call for fighter procurement as a percentage of AF TOA to remain at an historic low throughout the decade of the 1980s and into the 1990's until ATF procurement begins. As ATF procurement increases significantly (1994) the Air Force must then increase the priority on fighter procurement. However, even with a 2% budget growth and considering the worst years (1994-1996), achieving Roadmap quantities will not require the same percentage of AF TOA as during past periods of increased fighter priorities. (E.G., In 1978 Air Force used 11.8% of its TOA for fighter procurement while the Roadmap with ATF never requires more than approximately 8% of AF TOA.) In fact Air Force studies indicate the Fighter Roadmap is affordable with even a zero growth budget. This would require the Air Force provide priority budget allocations to fighter procurement for approximately five years but not beyond average high allocations seen in the past.

These decreased requirements are due to the Fighter Roadmap's attempts to stabilize procurement rates, thereby avoiding the necessity for large peaks of procurement quantities to replace aging force structure while simultaneously bringing a high technology, increased capability aircraft into the inventory. In essence the Roadmap stabilizes procurement and the only funding increases necessary are for new technology aircraft. Utilizing this procurement strategy has allowed the Air Force to minimize the affordability impacts of new aircraft intoduction into the fleet.

GROWTH IN TACTICAL AIRCRAFT

QUESTION: At the same time you want to procure the highly sophisticated aircraft outlined in your roadmap, the Air Force is also planning high cost programs like C-17, continued MX production, Stealth technology and Midgetman. With these other priorities, how can you count on large growth in tactical aircraft funding.

ANSWER: As stated in the CBO report, the Tactical Fighter Roadmap requires a 2% budget increase in each of the years following 1985. The Air Force concurs with this basic evaluation and does not consider budget increases of this magnitude as excessive.

Even with the high cost programs mentioned, it is up to the Air Force to provide internal budget priorities in consonance with national military requirements. When ATF is introduced in significant quantities, tactical fighter procurement will have been held at or below a historic low percentage of AF TOA for 13 years. It would be unrealistic to assume fighter procurement could be held at an all time low for two decades and still provide sufficient capability. In general, Roadmap planning assumes there will be some increase in fighter aircraft procurement priorities as ATF is introduced (1994-96). However the Roadmap actually requires a significantly smaller proportion of AF TOA than has been required previously (e.g., 11.8% in 1978 vs approximately 8% in 1995). In this context the Air Force does not feel fighter procurement requirements are extraordinarily high or reflect an unattainable level of funding.

ANNUAL INCREASED COSTS

QUESTION: CBO estimates the cost to procure and operate tactical forces from 1986 to 1990 to be $100 billion. Over the past five years costs have increased annually by over 3 percent to operate the force and 15 percent each year for aircraft production. Unless you have some reason to believe that these trends won't continue, isn't the $100 billion estimate too low?

ANSWER: The period from 1980 to the present is not representative of typical fighter procurement or Operations and Support (O&S) costs and cannot be extrapolated to provide a projection of future costs. Since 1980, the Air Force, with the approval and support of the Congress, has undertaken an intense effort to increase the readiness and sustainability of our tactical force. During this period, we have increased fighter aircrew flying hours, the primary driver of O&S costs, by 22%. Replenishment spares funding, also reflected in O&S, has increased almost 350% while initial spares funding, a large portion of procurement costs, has increased a similar amount. The result of this effort has been that we are now approaching our goals in readiness and sustainability. Costs in both the fighter procurement and the O&S areas, consequently, will not continue to grow but, in fact, can be expected to begin to decrease.

F-15 PRODUCTION

QUESTION: One option posed by CBO would save $4 billion by holding the F-15 production to 36 per year and retaining F-4s in the inventory for a year or two longer than planned. This approach would produce a 28 percent more capable force than exists today and meet your 40 wings goal. Since this meets your objectives, shouldn't we accept this option?

ANSWER: The model used by CBO to assess the optional force as 28 percent more capable than our current force is inadequate in this context because it fails to compete this force against potential adversaries in order to determine a true relative capability.

Additional assumptions used in the analysis do not reflect current Air Force plans for phase out of F-4s nor do they appear to consider modification programs already underway. The option presented in the CBO report does not fully consider long term force structure implications or relative cost effectiveness and certainly does not meet Air Force objectives.

HIGH-MIX AIRCRAFT

QUESTION: The CBO provides a "roadmap" for a larger force yielding more capability even if it contains fewer "high-mix" sophisticated aircraft. But the Air Force consistently elects to go with a smaller force by opting for all "high-mix" aircraft. Doesn't this suggest that modernization is your highest priority--not force structure?

ANSWER: Air Force priorities for the tactical fighter force are reflected by our balanced approach toward procurement which has resulted in both growth and modernization. Over the past ten years the "high-mix" aircraft, the F-15, has accounted for 28% of total fighter procurement; in FY 1986, it is but 21%. During this period we will have grown more than three fighter wing equivalents. Fighter procurement already approved through FY 1985 will permit further growth of two more wings while increasing the proportion of F-15s and F-16s in the total force. Our future fighter procurement strategy is designed to continue the progress toward a modern, capable force of sufficient size to adequately address the threat.

INCREASE FORCE STRUCTURE

QUESTION: The so-called "Tactical Fighter Roadmap" puts us on a course toward annual procurement of 220-260 tactical fighters per year in order to increase force structure from 36 to 40 wings. How did the Air Force arrive at this objective?

Where would the additional wings go?

ANSWER: The Air Force actually requires a force structure well in excess of 40 tactical fighter wing equivalents in order to ensure a reasonable assurance of success in a worldwide conflict (as validated in the Joint Strategic Planning Document). However, under current fiscal constraints and competing priorities in the National Defense Budget the Air Force has established 40 tactical fighter wings as an achievable near- to mid-term goal.

Much of the additional growth required to reach 40 wing equivalents will result from "fleshing out" existing 18 aircraft fighter squadrons to 24 aircraft, a more effective and efficient size. There are no new wing activations currently planned.

DISTRIBUTION OF ADDITIONAL WINGS

QUESTION: Currently, the Air Force has three fourths of the fighter wings in the U.S., 17 percent in Europe, and about 6 percent in the Pacific. How would the distribution change with 4 more wings?

ANSWER: The percentages of operational tactical fighters in the U.S. and the European and Pacific theaters are approximately 67%, 24% and 9% respectively. These proportions are expected to remain relatively constant as the total tactical fighter force expands toward 40 wing equivalents.

40 VS 44 WINGS

QUESTION: Not long ago, your objective was 44 tactical wings. Now there is virtually no discussion of this goal, and 40 wings has become the new moving target reassessed from 1986 to 1991. Given that you're below the Joint Chiefs of Staff target, what's magic about 40 or 44 wings?

ANSWER: Forty tactical fighter wing equivalents is considered to be a realistically achievable goal for the near- to mid-term. Forty four fighter wings has been stated as an outyear goal and represents a natural progression from 40 wings toward the JCS validated requirement.

CALVIN COOLIDGE'S PREDICTION

QUESTION: In 1980 we procured 391 fighter and attack aircraft. For about the same dollars in real terms, we bought 192 aircraft in 1985. This is a reflection of the cost growth which occurred due to changes and modifications. If this trend continues, aren't we rapidly approaching Calvin Coolidge's prediction that we'll have "one aeroplane and the aviators will take turns flying it?"

ANSWER: As discussed in the Tactical Fighter Roadmap, the Air Force procures fighter aircraft with the intent to maintain them in inventory for at least 20 years. In order to keep an aircraft for that period of time it is necessary to modify and improve it several times during its life. During the timeframe 1980-1985 major modifications and updates were accomplished to both our production line and in-inventory fighter aircraft. As examples, the F-16C and F-15E were developed, the F-15 Multi-Staged Improvement Plan and F-16 Multi-National Staged Improvement Plan were initiated, new radars and AMRAAM capability were developed and incorporated, and new engines were incorporated. These modifications and improvements are essentially complete and except for the possibility of the F-16F, the Air Force expects relative configuration stability in its fighter force, at least through the period of the FYDP. The Roadmap is also attempting to increase procurement rates which fell drastically after 1980 and eliminate the procurement instability demonstrated recently.

The result of this will be reflected in decreased unit costs as procurement moves into the late 1980's. This decrease has been historically demonstrated in all our fighters and the Air Force is confident this will return after the intense improvement period in the early 1980's. In summary, when considering historical trends for unit cost, the 1980-1985 period is not representative of actual aircraft cost history and should not be used as a predictor for future aircraft cost changes.

AIRFRAME CONTRACTS

QUESTION: One way to curb the cost increase trend is to discourage changes and modifications. Why can't the Air Force negotiate all its airframe contracts under a firm fixed price and hold changes to no more than 10 percent of the value of the airframe contract price?

ANSWER: The contract for each individual acquisition is carefully reviewed and the type most advantageous to the Government is selected. In some cases firm fixed price contracts are appropriate while other circumstances dictate a fixed price incentive type contract. The major cost increases associated with an airframe contract are primarily due to major design changes necessary to meet the changing threat. The type of contract would not preclude these changes. Each engineering change is closely reviewed to determine the need for the change prior to approving for production. Holding changes to a fixed percentage might force some necessary changes into the more expensive retrofit line instead of production incorporation.

DESIGN TO COST OBJECTIVE

QUESTION: The budget includes $243 million in R&D to start design of the Advanced Tactical Fighter which Air Force says will be at least 60 percent more expensive than the cost of an F-15---the most expensive fighter in the inventory today. Unless you envision the budget prospects getting any better, wouldn't it be prudent to establish a "design to cost" objective rather than sacrifice production rates in the future?

ANSWER: It is too early in a program that is still four years away from entering Full Scale Development to make realistic production cost estimates or to establish true "design to cost" objectives. The ATF is just now entering the demonstration/validation phase. The Air Force is concerned with major program acquisition costs and has established a unit flyaway cost ceiling of $40 million in FY 85 dollars to ensure that the ATF remains affordable in the Tactical Force Modernization Plan. If actual procurement costs reach this ceiling, the ATF would cost about 30 percent more than what we are currently paying for the F-15. Considering the major improvements in performance, supportability, and survivability offered in a new design, it is anticipated that the ATF will be a very cost-effective addition to the Tactical Air Forces of the 1990s.

F-15 AND F-16 PROCUREMENT UNIT COSTS

QUESTION: One of your key affordability assumptions is that F-15 and F-16 procurement unit costs will drop when you start producing ATF. Since the trend is in the opposite direction, what is the source of your optimism?

ANSWER: Historically, unit costs of every fighter aircraft have decreased over time, given a stable configuration. The attached charts (Figures 5, 6, and 7) show cost histories of three recent fighters (F-4, F-16, F-15). As is illustrated, in each case for a given model, unit prices dropped as total production quantities increased. Of even more interest is the fact that for the F-4D, F-4E and F-15C the unit costs actually dropped below that of the previous model and this was accomplished despite the vast increases in capability. It is the Air Force's contention that historic fact shows unit cost decreases are expected and predictable.

FIGURE 5

UNIT FLYAWAY COST COMPARISON
FY 86 $

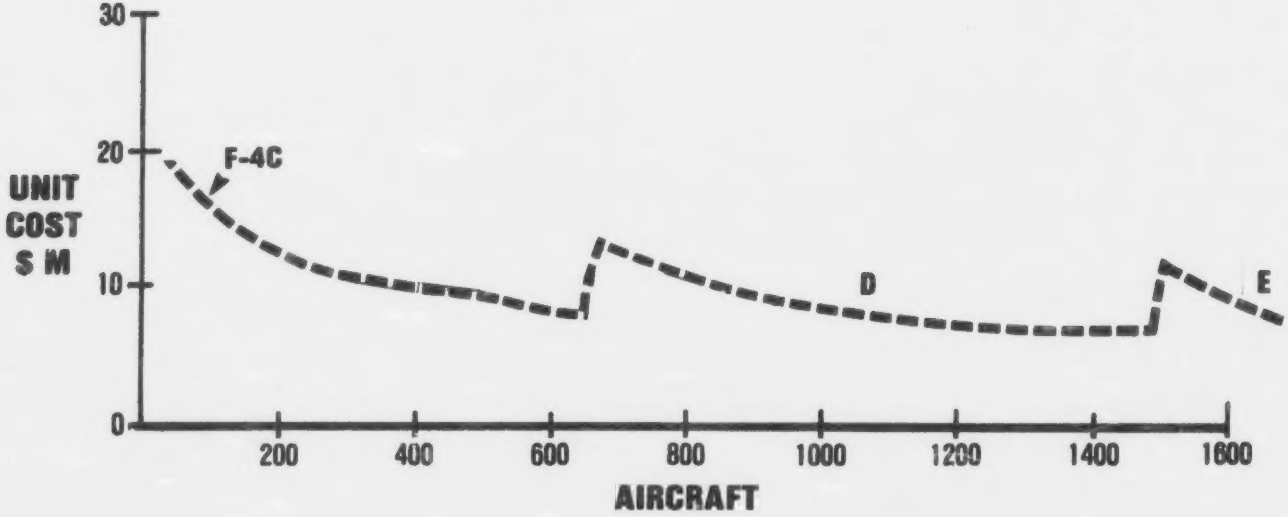


FIGURE 6

F-16 UNIT COST COMPARISON
FY 86 $

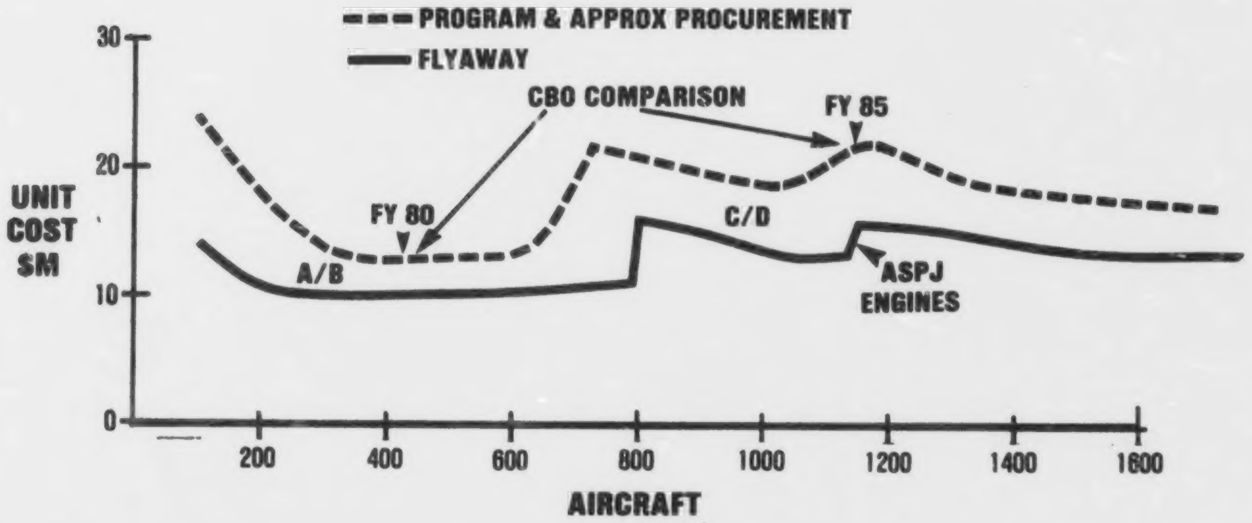
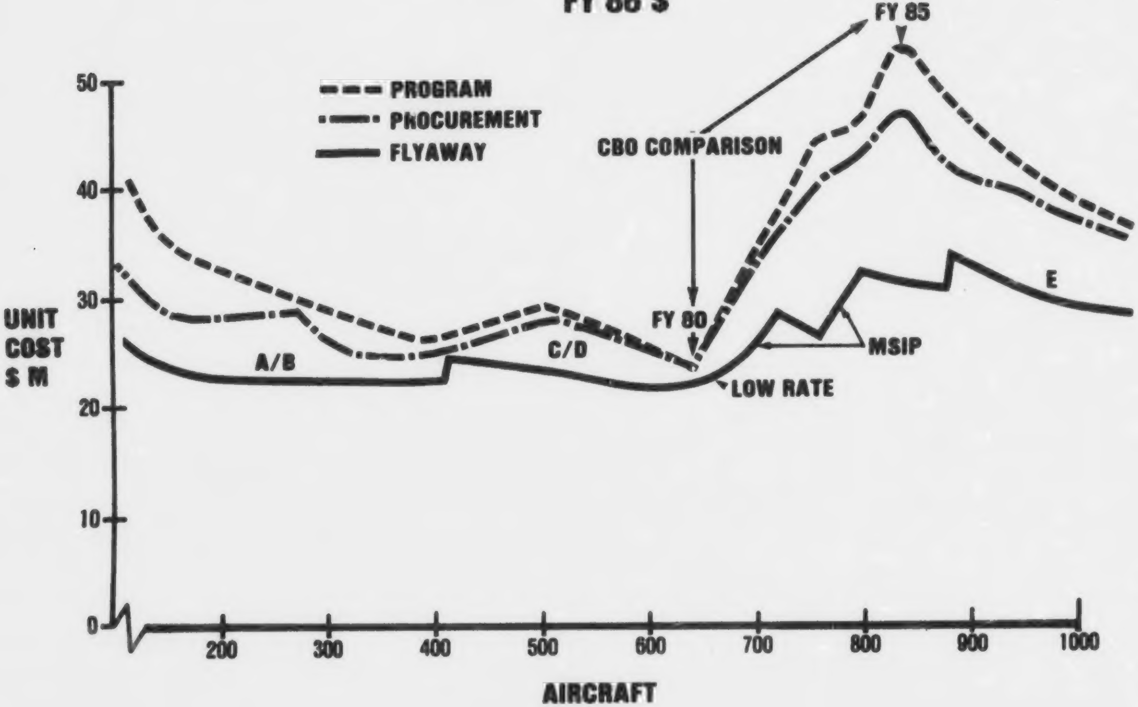


FIGURE 7

F-15 UNIT COST COMPARISON
FY 86 $



In the CBO study, unit cost comparisons were made between two selected snapshot procurement years, FY 80 and FY 85. Unit costs shown for F-15 and F-16 in 1980 represent all time low unit costs. In the five years following 1980, not only were production rates decreasing and unstable, but the F-16C model was introduced, major update programs - Multi-Staged and Multi-National Staged Improvement Programs (MSIP) were begun, new engines were incorporated, new radars were installed, shortfalls created by Congressionally directed cuts to support equipment in FY 83/84 were added to the FY 85 budget and development of the F-15E was begun. As a result the 1985 unit costs are at an all time high, however the configurations have again reached a stable point and production rates are increasing.

Therefore the Air Force feels that cost assumptions used to develop affordability conclusions should be based on the actual overall historic facts. Selected snapshot cost comparisons can be used to defend any number of conclusions, but do not necessarily reflect actual cost trends. Air Force unit costs used to develop affordability conclusions reflect historic decreases. However they were selected pessimistically and show decreases which are significantly lower than actual historic trends.

NAVY'S ATF PROGRAM

QUESTION: The Navy is also planning a development program for its "Advanced Tactical Aircraft" for attack/bomber replacements. Is there any way to merge these two developmental efforts?

ANSWER: The Air Force needs the Advanced Tactical Fighter as a follow-on to the F-15 in the air superiority role to counter the Soviet threat of the 1990s. The ATF will emphasize enhanced supersonic performance, increased survivability, supportability, and weapons optimized for air-to-air engagements. The Navy needs a new strike aircraft to replace the aging A-6 that will emphasize long range, extended loiter capabilities at subsonic speeds, and weapons optimized for air-to-surface engagements. A single aircraft design to effectively satisfy both Air Force and Navy requirements is not considered practicable. There is, however, the potential for cooperative development of advanced aircraft technologies which can support both Service's aircraft requirements. The Air Force and Navy have formed a joint working group to consider options for cooperation which could facilitate the development of each Service's design.

SPARE F-100 ENGINES

QUESTION: I understand there is a critical shortage of spare F-100 engines. Can you explain why this problem is occurring? Is the engine just unreliable or was the problem one of management inattention?

ANSWER: The shortage of F-100 spare engines is caused by a shortage of spare parts to maintain the engines. The problem has been long-term. It began during the development program when performance was stressed over durability, and has been continuously aggravated by the number of engine modifications, design changes and inspections required to maintain performance or improve reliability and maintainability.

The current situation is caused by a combination of new technical problems, procurement problems related to extensive competition/breakout efforts, and management problems centering on understated parts forecasting. Management actions are underway that should reverse the current trend by Aug 85, and return the engine spares to target serviceable levels by Sep 86.

F-100 ENGINE SPARE PARTS

QUESTION: The F-100 engine has been in the Air Force inventory for more than 10 years. Why would there still be a problem with forecasting spare part breakage rates?

ANSWER: Forecasting spare parts breakage rates for the F100 engine has been a long term problem caused by multiple factors. Program development stressed performance over component durability. Over 500 design changes or safety related inspections have been accomplished since 1973, many of those changes and inspections introducing new or redesigned parts, or causing unprogrammed parts replacement. The initiation of competition and breakout of parts from the prime contractor in 1978, and the acceleration of that process in the last two years, has brought us to the point where less than 10% of F100 engine parts are now purchased from the prime contractor. This effort has increased the number of first time suppliers, some of which could not meet delivery schedules or quality parameters, and some without the capacity to accelerate deliveries in response to parts shortages. Competition has also added steps to the procurement process that increase lead times for contract award and subsequent parts delivery. The aggregate effects of all these factors have had an impact on spares availability and given the perception of a much worse breakage forecasting problem.

Intense management actions have significantly improved the outlook for F100 parts availability. An improved management organization at the depot combined with forthcoming changes to the computer based requirements computation system will allow more timely reaction to the dynamics of F100 parts consumption. In addition, continuing F100 reliability and durability improvements will increase forecasting stability and lessen parts replacement requirements.

F-15, F-16 SPARE PARTS

QUESTION: Is the lack of spare parts lowering your F-15 and F-16 flying hour usage and reducing readiness?

ANSWER: There have been significant improvements in parts availability in the last few years. This is indicated by the decreasing trends in Not Mission Capable Due To Supply (NMCS) rates for both the F-15 and F-16.

NMCS Rate - Percent of Possessed Hours

	FY83	FY84	FY85 (Thru Mar 85)
F-15	16.1	9.6	6.9
F-16	10.1	6.5	5.8

The decreasing NMCS rates, in addition to a reorganization of our maintenance structure to improve productivity, reliability improvements introduced in the newer models of the F-15 and F-16, and the retention of experienced skilled maintenance technicians have resulted in peacetime readiness indicators climbing to record levels. The Mission Capable (MC) rates for the same period are:

MC Rate - Percent of Possessed Hours

	FY83	FY84	FY85 (Thru Mar 85)
F-15	63.9	73.0	78.2
F-16	70.5	78.3	81.6

At the same time, the Air Force has continued to improve our flying program. From a low of 11.5 sorties per aircraft per month being flown in 1978, we have improved our utilization rate every year to the point where we are presently flying each possessed F-15 and F-16 near our average goal of 21 sorties per aircraft per month.

There still are, of course, spare parts which are in short supply. The lead time for some complex components such as F-15 radar units, can be as long as three years. These parts were procured with the improved funding levels of past fiscal years, but have not yet been delivered. Other parts have experienced unanticipated failure rates and the Air Force is procuring additional components as well as improving the reliability of these components. The same management programs which have resulted in the decreasing NMCS rates are being applied to all these critical spares.

F-15, F-16 SPARE PARTS

QUESTION: Some press reports have blamed the problem on competitive buys. What is your view on this rationalization?

ANSWER: We do not support the opinion that competition is to blame for spare parts problems. On the contrary, we believe in competition and fully support its use in buying spare parts or any other item where it is practical. We have experienced some problems in obtaining quality products from new suppliers, but this is really a normal part of the competitive acquisition process. For the most part, these problems are routinely ironed out and then we enjoy the benefits of lower prices, better delivery schedules and a broader industrial base. On the whole, these benefits far outweigh any problems we may experience on an individual item.

REENGINE AIRCRAFT FOR THE GUARD

QUESTION: I am interested in the experience of the Guard to date with their reengined aircraft. Have they increased the Guard's mission effectiveness and would you judge the KC-135E to be a cost-effective solution based on the limitations experienced with the KC-135A?

ANSWER: The reengined KC-135E has greatly enhanced the mission effectiveness of the ANG. When compared to the KC-135A, the "E" model has demonstrated significant increases in capability and efficiency. Total offload capability is increased by 20%, fuel use is improved by 14%, noise level is reduced by 85%, and takeoff distance shortened by 14%. These improvements in mission delivery capability and operating capacity make the KC-135E a particularly cost-effective solution to the limitations experienced with the KC-135A.

GUARD'S MISSION

QUESTION: How would you assess the Guard's ability to carry out their mission in support of the active force? Would you agree that the tanker mission is an appropriate mission for our Guard forces?

ANSWER: This assessment will be narrowed in scope to encompass support of the KC-135 mission only. As a component of the Total Force, the Guard provides a ready arm of well maintained equipment and highly trained personnel to augment wartime surge requirements of the active and reserve components. The Guard has demonstrated its ability to support tanker wartime requirements by providing readiness training for its aircrews and support personnel. The current mix of active/ARF (Air Reserve Forces) is adequate to support the KC-135 SIOP alert and tanker task force requirement. The tanker mission is an appropriate mission for Guard forces.

INCREASE IN TANKERS FOR GUARD UNITS

QUESTION: General Conaway, director of the Guard, has testified that Guard units could make a significantly larger contribution to the tanker mission if the number of tankers was increased from eight per unit to ten. This increase would allow each Guard unit to maintain two aircraft on alert at all times, rather than one as is the current practice. Is General Conaway's assessment correct? If so, shouldn't this approach be explored further and what would be required in the way of additional crews, base operating support, spares, etc.?

ANSWER: General Conaway's assessment is essentially correct in that robusting to 10 PAA units would allow the Guard to pull additional lines of alert. Although there is no comparative cost data available for a 10 PAA KC-135 Guard unit, analysis of 11 PAA and 8 PAA units indicates an increase in cost to assume one additional line of alert in the Guard over a line of active alert. The Air Force has examined the structure of active/ARF tanker allocation in detail and determined the current balance is optimum to support SIOP and daily air refueling requirements. To alter the current structure, would impair refueling readiness capabilities.

TRANSFERRING TANKERS

QUESTION: Can't we in fact achieve a higher alert rate and spend less money by transferring tankers from the active force to the Guard units, providing each Guard unit with the robustness General Conaway spoke of and reengining these additional Guard aircraft with JT-3D engines?

ANSWER: Although a higher number of KC-135 airframes can be placed on alert by transferring tankers from the active force to the Guard, there is no requirement for a higher alert rate at this time. Cost analysis of 11 PAA and 8 PAA units indicates an increase in cost to assume one additional line of alert in the Guard over a line of active alert. Currently, there is no comparative cost data available for a 10 PAA KC-135 Guard unit. The Air Force has examined the force structure of active/ARF tanker allocation in detail and determined the current balance is optimum to support SIOP and daily air refueling requirements. The Air Force position is to reengine its KC-135 fleet with the CFM-56 which provides the long term solution to the air refueling requirements of the Total Force.

QUESTIONS SUBMITTED BY SENATOR STENNIS

COST OF F-20 AIRCRAFT

QUESTION: Secretary Cooper: In a hearing several weeks ago, several members asked for information concerning the cost of buying and operating F-20 aircraft, as compared with the F-16.

What is the status of this request?

ANSWER: F-16 and F-20 aircraft unit cost and Operating & Support comparison data is provided below. The F-16 cost figures are based on the FY 86 President's Budget Request for 180 F-16C/D aircraft as part of a multiyear program purchase. The F-20 costs are from Northrop's unsolicited proposal (multiyear for 396 aircraft) and are subject to all the assumptions and conditions of that document with 30 aircraft being purchased in FY 86.

	FY 86 Dollars ($M)	
	F-20(30 ACFT)	F-16C/D(180 ACFT)
Recurring Unit Flyaway	13.5	15.3
Procurement Unit Flyaway	15.0	19.9*

*Unit cost less long lead debits and credits

The flyaway cost of the F-16 aircraft is higher because it includes the cost of an advanced electronic warfare jammer and radar warning receiver, IFF equipment, navigation equipment, data links, etc. If these subsystems were replaced with less capable subsystems, and growth provisions for advanced systems like LANTIRN, an IFF interrogator, AMRAAM missile, and the global positioning system, were removed, the cost of the F-16C/D would decrease. Most cost comparisons imply equal operational capability; the figures above are not a direct "apples to apples" comparison. In the Operating & Support cost comparison area, we envision the F-20 aircraft being 20 to 30 percent lower than the F-16A aircraft; no historical data is available on the new F-16C/D. This difference in support cost is driven by projections of fewer maintenance people, higher reliability avionics (fewer, less capable subsystems), lower quantities of replenishment spares, and lower consumable spares (fuel,etc.) cost.

COMPARE F-16 AND F-20

QUESTION: Can you now tell us anything about how the F-16 and F-20 compare costwise?

ANSWER: Initial data for cost comparison of the F-16 vs F-20 are presented below. The F-16 cost figures are based on the FY 86 President's Budget Request for 180 F-16C/D aircraft as part of a multiyear program purchase. The F-20 costs are based on the Northrop's unsolicited proposal and are subject to the assumptions and conditions of that proposal (assumes multiyear procurement). A significant amount of the delta cost between the F-16C/D and F-20 unit costs is a result of subsystem differences, e.g., radar warning receivers, IFF equipment, navigation equipment, data links, etc. If the F-16 systems were replaced by the generally lower cost/less capable subsystems found in the F-20 and if provisions for additional equipment (LANTIRN, IFF interrogator, GPS) were removed from the F-16, the cost delta would decrease. Most cost comparisons imply equal capability; the figures below are not a direct "apples to apples" comparison since they do not take into account these differences in capability.

	In FY 86 Dollars ($M)	
	F-20(30 ACFT)	F-16C/D(180 ACFT)
Recurring Unit Flyaway	13.5	15.3
Procurement Unit Cost	15.0	19.9**
Program Unit Cost	15.0*	21.0

* Northrop's proposal contains no requirement for Research and Development (R&D) funds. The Air Force, however, is still evaluating the requirement for R&D funding for things like weapons certification, aircraft climatic testing, and other areas.
** Procurement unit cost less long lead debits and credits.

COOPERATION FROM NORTHROP AIRCRAFT CORPORATION

QUESTION: Are you receiving full cooperation from Northrop Aircraft Corporation?

ANSWER: We have requested data from the Northrop Aircraft Corp. on the F-20 aircraft on several occasions in the recent past. On every occasion, their response has been rapid, complete, and indicated an attitude of full cooperation regarding the need to support our efforts.

NEED FOR ADVANCED TACTICAL FIGHTER (ATF)

QUESTION: Secretary Cooper: The 1986 budget includes funds for the continued development of a new tactical fighter. Full-scale development is planned to start in 1989 and the IOC is scheduled for 1995.

Why do we need this new fighter aircraft? What can this fighter do that cannot be done by upgraded F-15 and F-16 aircraft?

ANSWER: Although planned improvements will extend the operational utility of the F-15 and F-16 in selected missions throughout the 1990s, inherent airframe limitations will make it impossible to satisfy future air superiority requirements by upgrading these designs. The Soviets are presently fielding new fighters with a look-down/shoot-down capability and performance characteristics similar to our F-15s and F-16s. Additionally, the DIA forecasts that the next generation of advanced Soviet fighters will enter service during the mid 1990s. The increased lethality of the Soviet capability will eliminate the relative sanctuary of the low altitude environment used by our penetrating fighters/bombers. This look-down/shoot-down threat dictates the need for an advanced tactical fighter capable of conducting air superiority missions over enemy territory at the time and place of our choosing. The ATF blends enhanced supersonic performance and greatly improved survivability features in an innovative air superiority aircraft designed to fight and survive in hostile airspace.

COST OF THE ATF

QUESTION: How much does the Air Force expect this plane will cost?

ANSWER: It is too early in a program that is still four years away from entering Full Scale Development to make realistic procurement cost estimates. The ATF is just now entering the demonstration/validation phase. The Air Force is concerned with major program acquisition costs and has established a unit flyaway cost ceiling of $40 million in FY 85 dollars to ensure that the ATF remains affordable in the Tactical Force Modernization Plan.

COST COMPARISON

QUESTION: How does this cost compare with the F-15 and F-16 costs?

ANSWER: The Air Force is concerned with major program acquisition costs and has established a unit flyaway cost ceiling of $40 million in FY 85 dollars to ensure that the ATF remains affordable in the Tactical Force Modernization Plan. If actual procurement costs reach this ceiling, the ATF would cost about 30 percent more than what we are currently paying for the F-15. Considering the major improvements in performance, supportability, and survivability offered in a new design, it is anticipated that the ATF will be a very cost-effective addition to the Tactical Air Forces of the 1990s.

AFFORDABILITY OF THE ATF

QUESTION: Is this new aircraft affordable? Will the Air Force be able to achieve and maintain its 40-wing TAC air goal, if it must pay for the ATF?

ANSWER: The Air Force has completed a review of Tactical Fighter Roadmap affordability through the year 2000. This review reached the same basic conclusions that a recent CBO study concluded; the Roadmap procurement strategy which includes ATF was affordable even if budget growth was limited to 2% per year.

This roadmap procurement strategy would provide for first ATF procurement in FY 92 ATF IOC in 1995 and approximately five operational wings by the year 2000. The Air Force feels the ATF, within the context of the Roadmap procurement strategy is an affordable and necessary aircraft.

A-10 REPLACEMENT

QUESTION: The Air Force recently requested information from industry for a new close air support aircraft to replace the A-10.

What is the Air Force's current thinking on this aircraft?

Is there any money in the FY 1986 budget for it?

When does the Air Force see starting production on this aircraft?

ANSWER: The Air Force is committed to improving the close air support structure to complement the evolving Army scheme of maneuver. The aircraft will be an existing aircraft missionized for close air support.

There is no money in the FY 1986 budget for close air support.

The Air Force expects to begin development in FY 1987 leading to first aircraft delivery in FY 1989.

SUBCOMMITTEE RECESS

Senator **Stevens**. We stand in recess until 2 p.m. for the Space Program.

Thank you.

[Whereupon, at 11:20 a.m., Thursday, May 9, the subcommittee was recessed, to reconvene at 2 p.m., the same day.]

BLANK PAGE

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

THURSDAY. MAY 9, 1985

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 2 p.m. in room SD-192, Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding

Present: Senators Stevens, Garn, D'Amato, and Rudman.

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE AIR FORCE

STATEMENT OF HON. EDWARD C. ALDRIDGE, UNDER SECRETARY OF THE AIR FORCE

ACCOMPANIED BY BRIGADIER GENERAL DONALD J. KUTYNA, DIRECTOR OF SPACE SYSTEMS & COMMAND, CONTROL, COMMUNICATIONS, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

STATEMENT OF JESSE MOORE, ASSOCIATE ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCOMPANIED BY:

MACK STEEL, DIRECTOR OF RESOURCES, OFFICE OF SPACE FLIGHT DIVISION, NASA HEADQUARTERS

CHESTER LEE, DIRECTOR OF CUSTOMER SERVICES, OFFICE OF SPACE FLIGHT DIVISION, NASA HEADQUARTERS

SPACE PROGRAMS

OPENING COMMENTS

Senator STEVENS. You know what we are here for. There is no need to put the statement in the record.

I am glad to have you back Mr. Secretary, and Associate Administrator Jesse Moore, we are glad to have you with us here. We are really seeking some answers to some questions.

We had a statement from you, Mr. Secretary. Does NASA want to make any comment before we start?

Mr. MOORE. I don't have any opening statement, Mr. Chairman.

Senator STEVENS. And we have General Kutyna.

Do we have your names?

Mr. **Moore**. Yes; this is Mack Steel, Director of Resources in the Office of Space Flight, NASA Headquarters. And this is Chester Lee, Director of Customer Services, at NASA Headquarters in the Office of Space Flight.

Senator **Stevens**. What we are dealing with here, to begin with, is whether or not we can define the cost that NASA and the Air Force are relying on as far as Shuttle launches are concerned for the fiscal year 1986.

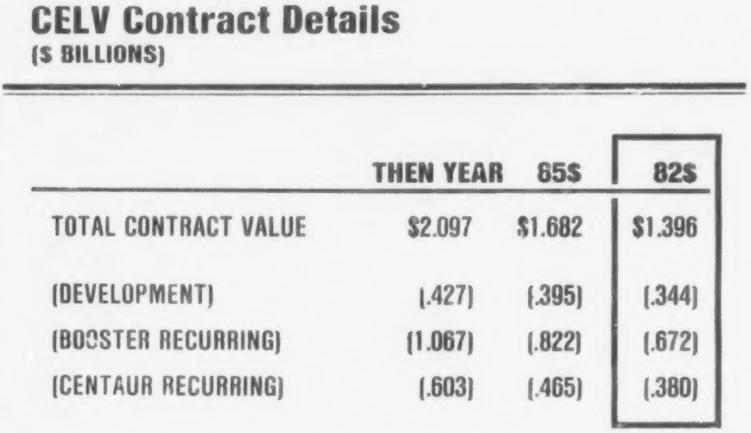
SHUTTLE LAUNCHES AND COST

Senator **Stevens**. Can you tell us how many launches are planned by each of you now and what do each of you figure your costs are?

Mr. **Aldridge**. Mr. Chairman, to put this in some kind of constant terms, I do have a couple of charts that may get our dollar figures in the right year and I would like to show those to you, just two quick charts.

General Kutyna can explain those charts for you.

Senator **Stevens**. We don't have much time in between these votes. I don't want to get hung up on a 35-minute presentation of charts.



CELV Contract Details
($ BILLIONS)

	THEN YEAR	85$	82$
TOTAL CONTRACT VALUE	$2.097	$1.682	$1.396
(DEVELOPMENT)	(.427)	(.395)	(.344)
(BOOSTER RECURRING)	(1.067)	(.822)	(.672)
(CENTAUR RECURRING)	(.603)	(.465)	(.380)

Slide 1

BASELINE COSTING

General **Kutyna**. The first thing I would like to do is get us in common year dollars. You have here the then-year dollar program, a $2.1 billion CELV program including development, booster, and Centaur.

I would like to reduce that to 1982 dollars because that is what NASA costs are. We will take the $2.1 billion program and break it down into these numbers so that we can talk apples and apples in 1982 dollars.

Senator **Stevens**. Do you agree with that, NASA?

Mr. **Moore**. Yes, sir.

Senator **Stevens**. You are talking about 1982. You haven't spent these dollars yet? How can you talk 1982 dollars?

General **Kutyna**. That is a reference. The data base that we performed was done, Mr. Chairman, in fiscal 1982 dollars. The Shuttle cost-per-flight study was done in fiscal 1982 dollars.

Senator **Rudman**. We could make an easy conversion of that with a factor if we want to.

CELV VS Shuttle Cost To The Nation

(FY 82 $ IN MILLIONS)

SHUTTLE COSTS BASED ON 20 FLTS/YR FROM KSC

CELV		SHUTTLE
$ 344	DEVELOPMENT	CONTINUING SHUTTLE R&D NOT INCLUDED
$ 672	PROCUREMENT/LAUNCH OF TEN FLIGHTS	$ 840
$1016	TOTAL	$ 840*
$101.6	COST PER FLIGHT	$ 84.0

DIFFERENCE

$17.6M

* SOURCE: CBO MARCH 1985 REPORT

Slide 2

SHUTTLE V. CELV COST

General **Kutyna**. With that basis in 1982 dollars, I will show you the next chart. This will compare Shuttle cost versus CELV cost. This is the number for 10 shuttle flights, $840 million referenced in the CBO report of March 1985, and NASA agrees.

It is based on 10 flights. So, $84 million per Shuttle flight. The ELV, including development and procurement for 10 flights, adds up to $1,016 million, $101 million per flight versus $84 million per flight. That is the difference in cost per flight flying the ELV.

Senator **Stevens**. Take me back to real money then. That is still 1982 dollars?

General **Kutyna**. That is 1982 dollars.

Senator Stevens. What are the 1986 dollars? I can tell you a long story about my win at the crap table in India. I was dealing in ruples. I didn't know how much money I had won. That is the problem I have when you say 1982 dollars.

General Kutyna. $25 million is the difference.

Senator Stevens. Per flight?

General Kutyna. Per flight, in 1985 dollars.

Senator Rudman. How much?

Senator Stevens. In 1985 or 1986?

Mr. Aldridge. Fiscal 1985 dollars, this year's dollars.

Senator Rudman. Would be $25——

Mr. Aldridge. Million.

Senator Stevens. As opposed to $17.5 million?

Please provide for the record for me the mathematics and the formula that came up with that because I think that is wrong. My own calculations are that it is closer to 20.5, constant 1982 dollars, in 1985 real dollars.

General Kutyna. We will do that.

Senator Stevens. We will get that later. NASA agreed with that?

Mr. Moore. Yes, sir, we agree with the $84 million based on our cost-per-flight study during the timeframe of launching the shuttle at the rate of 24 flights per year and fiscal 1989 through the fiscal 1989 timeframe. That is an average cost per shuttle launch in fiscal 1982 dollars.

[The information follows:]

CELV VS SHUTTLE COSTS

The cost charts in question are attached. The method used to convert FY 85 dollars into FY 82 dollars was to divide the FY 85 number by the appropriate OMB/OSD inflation index. The calculation for CELV is as follows:

	FY 85 $	Inflation Index	FY 82 $
Development	$395M	1.148	$344M
Booster Recurring (10)	$822M	1.224	$672M
	$1217M		$1016M

The Shuttle flight cost was converted from FY 82 dollars to FY 85 dollars by multiplying the FY 82 number by the appropriate OMB/OSD index:

	FY 82 $	Inflation Index	FY 85 $
10 Shuttle Flights	$840M	1.145	$ 962M

The CELV and Shuttle costs were then compared as follows:

	FY 82 $	FY 85 $
CELV	$1016M	$1217M
Shuttle Flights	$ 840M	$ 962M
Difference	$ 176M or $17.6M per flight	$ 255M or $25.5M per flight

CELV VS Shuttle Cost To The Nation

(FY 82 $ IN MILLIONS)

SHUTTLE COSTS BASED ON 20 FLTS/YR FROM KSC

CELV		SHUTTLE
$ 344	DEVELOPMENT	CONTINUING SHUTTLE R&D NOT INCLUDED
$ 672	PROCUREMENT/LAUNCH OF TEN FLIGHTS	$ 840
$1016	TOTAL	$ 840*
$101.6	COST PER FLIGHT	$ 84.0

DIFFERENCE

$17.6M

* SOURCE: CBO MARCH 1985 REPORT

43-798 O—86——15

CELV Contract Details

(\$ BILLIONS)

	THEN YEAR	85\$	82\$
TOTAL CONTRACT VALUE	\$2.097	\$1.682	\$1.396
(DEVELOPMENT)	(.427)	(.395)	(.344)
(BOOSTER RECURRING)	(1.067)	(.822)	(.672)
(CENTAUR RECURRING)	(.603)	(.465)	(.380)

445

NUMBER OF CELV FLIGHTS

Senator **Stevens**. How many do you plan on making, Mr. Secretary?

Mr. **Aldridge**. Ten flights over the late 1988 fiscal year—1989 through the 1992 time frame, at the rate of two flights per year.

Senator **Stevens**. We are talking about 1988 to 1992.

What is that difference in terms of then year dollars?

Mr. **Aldridge**. $25 million a flight is what we said it cost the taxpayer for the additional capability provided by the CELV.

Senator **Stevens**. You just told me it is $25 million a flight for 1985. If you flew 10 flights this year, you would have $250 million. You are talking about 10 flights between 1988 and 1992; is that right?

Mr. **Aldridge**. Yes, sir. The rate is two flights per year for the CELV for a period of 5 years. Two flights a year compared to 24 flights a year for the shuttle mission.

Senator **Stevens**. You have agreed to the figures.

What is your loss in terms of revenue if they do this?

NASA LOSS

Mr. **Moore**. At two per year and current price to DOD of $55 million a flight, it is roughly $10 million a year (fiscal year 1982 dollars), if we were to recover the full price of two launches. We do operate with the Air Force on a kind of quid pro quo basis where we offset services that the Air Force provides for us. We are currently charging the DOD about $55 million a flight in fiscal year 1982 dollars for launches in fiscal 1986 to fiscal 1988 period, compared to the average cost of $83 million. Our losses depend on which base you want to choose, Mr. Chairman. It would be anywhere from $50-$60 million per year to about $110 million per year.

Senator **Stevens**. What we are trying to do is find out if there is redundancy. Under the agreement you have reached and I assume you have reached an agreement——

Mr. **Aldridge**. Yes, sir.

NASA/DOD PRICING AGREEMENT

Senator **Stevens**. How much did DOD pay to NASA for not flying those two flights?

Mr. **Aldridge**. Sir, we don't pay anything to NASA for not flying flights. We actually have a pricing agreement so that NASA can plan for the number of missions expected by the DOD up to 3 years in advance. We tell them in advance what the mission model is going to be and we pay them in the year ahead of that flight what that mission calls for.

Senator **Stevens**. Aren't you required to pick up some of the overhead cost even though you don't fly?

Mr. **Aldridge**. No, sir. We have a pricing policy based upon a negotiation that we pay them in the year ahead of the flight. We actually are 3 years ahead so that NASA does not have to plan for more missions than they can really fly, based on the lead time of ordering the parts and planning to fly those missions.

Senator Stevens. I am informed you committed at least one-third——

Mr. Aldridge. Yes, sir, we have done that.

Senator Stevens. You have targeted 24 flights per year and you have committed to at least one-third of them.

Mr. Aldridge. Yes.

Senator Stevens. For 10 years?

Mr. Aldridge. An average of eight per year for 10 years.

Senator Stevens. You are going to pay for those whether you fly them or not?

Mr. Aldridge. Yes, sir, we basically are going to do that. It has to be based on the actual mission. There may be some years we may fly 10 missions. There will be peaks and valleys. We have to work out the exact details on a year-by-year basis how many we will fly.

On the average over that 10 years we will fly eight missions per year. We are going to commit the funds to NASA to do that. It will have to be worked out in specific details year by year according to the actual launch rate that will occur.

LAUNCH SECURITY

Senator Stevens. How much of this is brought about because of that flap that occurred over that one shuttle launch where all the secrecy was lost?

Mr. Aldridge. None.

Senator Stevens. Is this a way to get secrecy out of Vandenberg that you can't get out of Kennedy?

Mr. Aldridge. No, sir, the ELV's will fly out of Kennedy only.

Senator Stevens. They won't be NASA, so they won't be subject to the same Freedom of Information provision?

Mr. Aldridge. No, sir, that is not the reason. We proposed this agreement long before we flew the mission out of Kennedy on January 24.

SHUTTLE LAUNCH RISK

Senator Stevens. Why can't you make an agreement with NASA to have one-third of the 24 flights per year, why can't you make an agreement with NASA in advance that they will guarantee you 10 flights a year rather than 8 and we won't have to buy these other launch vehicles?

Mr. Aldridge. Mr. Chairman, I don't believe NASA nor we could guarantee the number, the actual flights of the Shuttle. The Shuttle could be grounded for some technical reason. We could bang one up on landing or something like that.

The problem would be with four vehicles. Our concern is with only four vehicles as our entire access to space is an unacceptable risk from a national security point of view.

Senator Stevens. This looks like finding a new mission for an old missile.

Mr. Aldridge. No, sir, we are basically flying those missions today. The Titan 34D is flying today and will fly through 1988.

Senator Stevens. I have some other questions on this.

SHUTTLE COMPETITION

Senator **Rudman**. I am not sure, I will have to go back and read these numbers. One statement of national policy which is made in relation to the shuttle for the purpose of presentations to Congress is that the shuttle is the primary and most important vehicle this country uses for all sorts of missions. One of the problems you will have in the coming 2 years is French Ariane competition. The more we can do to attract commercial business, which appears to be declining in some ways, the better off we will be.

IMPACT ON OPERATIONAL COST

How seriously does this diversion of a substantial mission, putting national security aside—I assume you would prefer to launch everything the Air Force has—effect your operating cost?

Mr. **Moore**. It is obvious that we are planning a flight rate of 24 flights a year beginning in fiscal year 1989. We have currently in our mission plan a DOD flight rate, as Mr. Aldridge said, averaging about 8 flights per year. In fact, this fiscal 1989 we have 10 Department of Defense payloads planned for flights on the shuttle.

Senator **Rudman**. Are the other 14 full?

Mr. **Moore**. The other 14 are full at this point in time. We have 7 NASA flights planned for that period of time. We also have 6 foreign and commercial payloads that are planned, equivalent flights that are planned, adding up to a total of 24 flights.

Yes; to answer your question very pointedly, I would like to fly all the DOD payloads on the shuttle. There is no question about it. However, I do think with the plan we have laid out here we do have a very strong DOD commitment to the shuttle. We have an agreement that says that DOD will fly at least one-third of the shuttle flights during that period of time.

We need to fly the shuttle at a high frequency in order to lower our operating cost. If we lose flights off the shuttle, if the flight numbers go down, our cost per flight increases. We have a base of operational cost that is required to operate the shuttle. The more flights we fly, the cheaper the cost per flight.

To answer your question, yes, I would like to fly all the flights that we could. The other point on the commercial thing, if I might add a point, is that we are actively competing with the French, with the Ariane. A fundamental factor is the price we charge our commercial customers. We are in a head-to-head competition with the Ariane for launching communications satellites.

That market place is pretty stable if not declining at this point in time. So, the marketing is very, very tough. We need to do everything in NASA to lower our operating costs so that we can pass along to the commercial customer the cheapest price we possibly can offer.

Senator **Rudman**. I am sure you do want to lower your operating costs because if you don't, you will lose a lot of potential business. That loss will cause us to appropriate more taxpayers' funds for the shuttle. Obviously, the more you can use the shuttle for legitimate U.S. needs, the cheaper the price you can offer to others.

I assume this is a system in which the overhead, direct cost of operating the flights are rather enormous. If you could have 40 flights a year, for instance, the overhead across those 40 flights would be a good deal less than the direct operating cost of the 40 shuttle missions.

NATIONAL SECURITY ISSUE

I want to turn to the national security issue, Mr. Aldridge. The argument is made, with justification, that in the future during times of national emergencies, national alerts, periods of crisis, it might be necessary to put things up rather quickly. We want the ability to do that.

What is the weight classification of the things we have to put up quickly as opposed to the weight of the things that you need this vehicle to get up? What things must we get up quickly? Are we talking about communications satellites?

Mr. **ALDRIDGE**. I can talk about three different satellites programs we picked.

DEFENSE SUPPORT PROGRAM

The first one is a Defense Support Program. [Deleted]. It will weigh in the 5,000 to 6,000-pound category, probably growing to the 7,000 or 8,000-pound category by early 1990's.

Senator **RUDMAN**. I want to go through these one by one.

What do we presently have that will launch that?

Mr. **ALDRIDGE**. Titan 34D transtage launches that vehicle out of Kennedy now.

Senator **RUDMAN**. That is the present system?

Mr. **ALDRIDGE**. That is the present system.

Senator **STEVENS**. Who launches it now?

Mr. **ALDRIDGE**. We do. It is an Air Force launch.

Senator **RUDMAN**. No more R&D on that. We load them and shoot them off?

Mr. **ALDRIDGE**. Yes, sir. That production is ending now. The last flight of the Titan 34D will occur in 1988.

Senator **RUDMAN**. What is the second type of satellite?

MILSTAR

Mr. **ALDRIDGE**. That is Milstar. It is a new communications system that will provide the survivable command and control communications systems necessary to support strategic and tactical forces worldwide in the future. That will launch in late [deleted].

However, because it has already been designed to fly on the shuttle, the first three satellites, which we call the Block I satellites, will continue to fly on the shuttle. The first Block II satellite comes onboard toward the [deleted] and that one will fly upon the expendable launch vehicle. All Milstar Block II satellite will be dual compatible to fly either on the shuttle or ELV.

Senator **RUDMAN**. But not on the other boosters that we have in the inventory?

Mr. **ALDRIDGE**. No, sir, the boosters we currently have are becoming obsolete because at the time we made the decision in the seventies to go shuttle only, all of the satellites began to transition to the shuttle size and weight capacity.

Now, as a result of that decision, we cannot now go back to the existing Titan 34Ds of Atlas-Centaurs and put the same payload on those expendable boosters that are capable of flying on the Orbiter.

Senator **RUDMAN**. The third one?

Mr. **ALDRIDGE**. The third is a classified satellite that goes beyond the classification of this particular hearing, in a different category.

Senator **RUDMAN**. Can you talk about weight?

Mr. **ALDRIDGE**. It has a geosynchronous orbit, has the same weight capacity as the other two with a maximum growth that we can project for the future of 10,000 pounds to geosynchronous orbit.

Senator **RUDMAN**. Are you saying that all three of these, under certain world scenarios, would have to be launched almost within a matter of days?

Mr. **ALDRIDGE**. Yes, sir. Those are the three satellites because of their critical national security missions that we decided place the most launch-on-demand requirements on our launch facilities.

In order that we could have that satellite once it is ready to go for replacement, a booster is sitting there essentially mated, be it in a different facility, but basically ready for launch should the necessity arise so that we can get it off in a matter of days if required.

Senator **RUDMAN**. Now you are talking about how many a year with your ELV?

Mr. **ALDRIDGE**. Two per year.

Senator **RUDMAN**. For a total of how many?

Mr. **ALDRIDGE**. Ten.

Senator **STEVENS**. Obviously, the question that we have to decide, I suppose, and I will be interested to hear Senator Garn's questions because he is obviously the most knowledgeable man in this panel, is whether or not there is any possibility whatsoever of having certain launch vehicles in place with these satellites on them that would be launched in case of the emergency we are talking about.

As you know, we do have other things which are classified that we can't talk about here that have to do more with the Shuttle. Thank you.

Mr. **ALDRIDGE**. That is exactly the proposal.

Senator **RUDMAN** I understand that is where you think you are. It is a fairly good bundle of money. Thank you.

Senator **STEVENS**. Senator Garn.

Senator **GARN**. Thank you, Mr. Chairman.

TURF BATTLE

I am not sure I know quite where to begin. This has been going on for a long time. As the chairman knows, last September I held out money for proceeding, not because I did not feel there was need for a backup capability of the shuttle. I never disagreed with that need.

The question was whether we go back and modify Titans or whether we try to go with shuttle-derived technology. That question still has not been answered for me.

To be very candid, gentlemen, I think a lot of this is the typical turf battle that I have seen happen over and over again with various agencies in the 10 years I have been here.

I am not asking you to answer questions. I am making a speech right now. You don't have to worry about owning up to anything.

There is no doubt in my mind, and I guess I could have worn my uniform today and shown my loyalty to the Air Force, if that would make you feel better, but the Air Force wants to run its own space program. You don't have to answer, but that is true. They resent NASA, Mr. Chairman.

They have, because that is a civilian agency and they want to run their own show like the Navy does and all of them. We can't afford the luxury of those kinds of turf battles.

You are going to end up when this budget is over, and I don't like either one of them, NASA will be zeroed and the Air Force will be zeroed. That is the best you are going to do, freeze at 1985 levels if we can hold that with the House.

We don't have the luxury of playing turf battles any more. We have to make decisions on the basis of the merits of the program, and what is most cost effective.

I am not going to argue with your numbers because they will all be wrong when they come around. I don't question your figures today, but they will change. They always do. I used to believe numbers in hearings, but I don't any more. It is not your fault. Our numbers are worse than anything else in the Congress. So that is Government-wide. So, it is not too important what you show us today.

I think the question is much more fundamental. Senator Rudman touched on the issue of national security. $2 billion doesn't bother me. I can be convinced that we need those 10 Titans for national security. We don't have the time to discuss all that today.

But what additional assurance do we get even if we are dual campatible, as you mentioned? You talk about ability to launch quickly. That doesn't get into the type of detail we need either.

Whether you are using the shuttle or whether you are using an ELV, you have to look at weather; you have to look at vehicle integration, you have to look at pad preparation, and launch windows.

RAPID REACTION

I think if you are talking about being very quick, it is a little bit misleading. Somehow the shuttle takes weeks of preparation and you are going to push some kind of button to put a Titan up there in a couple of days?

You are not going to do that. There are a lot of factors I won't take the time to go into next. This argument becomes a great deal more important because of what is happening to both of your budgets.

ADDITIONAL ORBITER V. CELV

The next question I would really have—eventually I will let you say something—is originally the concept was a backup. Now you buy these 10 vehicles at $2 billion. You talk about 24 vehicles a year. We can buy a fifth Orbiter for a billion dollars. That will guarantee a lot more shuttle reliability if you have a fifth around there. So, that is a question that has not been addressed.

We are going to spend $2 billion for 10 expendable missiles. It would make a lot more sense to spend $2 billion for a fifth Orbiter that can be used 100 times and make certain that we can meet that 24 per year because I am not convinced—I don't care what the administration says—I haven't been convinced we can meet 24 a year with 4 Orbiters.

Now, that is a question we need to address, too, Mr. Chairman. Where is the $2 billion better spent? I don't know how we can do that right now.

My point is if we are going to have a backup capability, which I agree with, do you plan on using two of those a year as Senator Rudman just mentioned, or letting them sit as standby for that quicker launch, which you hope you can achieve, rather than using them?

SDI IMPLICATIONS

You use 10 and the implication of getting into SDI, the more heavy kind of lift capability we are going to have there, what are we doing about that if we ever get to a SDI? Do we have any growth potential in the fixed up Titans, new hubcaps or not?

The Air Force says we have. I haven't been convinced there is growth potential. When I see a little chart that shows a few strapped-on boosters, my 6-year-old can draw those.

There is no engineering or any specification that shows me you have the capability of that growth potential, that that is going to work and you are going to have a few of them blow up on the pad when we start the unmanned launches to begin with.

I am rambling into all sorts of subjects, but it seems to me the question, Mr. Chairman, is far, far broader than 10 Titans and $2 billion. We are looking at quality implications on SDI, the future of the shuttle, and if Ariane is more competitive in some ways, it would seem to me at least our own Government ought to be cooperating, between two different agencies of Government, to make certain that what I believe is a national treasure is an accomplishment beyond measurement.

I also recognize now I am suspect. You already know NASA has bought me. The New York Times has said so. Jesse will not be convincecd of that, by what I have done on space stations, withholding money there. The press won't treat that.

You need to recognize that I have flown the F-15, F-16, and the B-1, too. Neither one of you have bought me that way.

I could get on with the whole general policy implications again far beyond the $2 billion. We don't have the time to go into each one of those questions.

Can each of you give me a general response about the future on some of these broader issues and show me a chart that you both agree on, it will cost *x* number of dollars for each launch? I don't think that is even important.

Mr. ALDRIDGE. Let me start off.

NATIONAL SECURITY REQUIREMENTS

I think we have solved the turf battle problem. Jim Beggs and I got together and agreed on an approach. We implemented a national security space launch strategy on February 25. We committed to one-third of the Orbiter flights so that we could show that we are not abandoning the shuttle.

It is absolutely essential that the Department of Defense have that Orbiter fleet to meet its national security requirements.

We felt that we needed two CELV flights for those special kinds of payloads that could not afford to be put on an Orbiter and wait to replace a failed satellite on orbit. We have to manifest a satellite for a shuttle flight based on anticipated failure rate.

We can't fill the skies with satellites any time we want to. They are tied to ground stations that can only support so many. The satellites we take to put on the ELV are based on those we think essential to get in orbit as quickly as possible to replace a failed satellite. If we mainfest on a shuttle plan, for a shuttle mission, which we have to do years in advance for a particular satellite and the satellite that is up has not failed, that Orbiter has to go do some other job, it has another mission, another manifest waiting in line, we would have to pull that satellite back off the Orbiter so that it can do its job.

That would be the kind of thing that would be disruptive to NASA trying to get commercial users onboard because we would have bumping privileges. When a satellite did fail, we would grab the Orbiter and launch it as quickly as we could.

LAUNCH-ON-DEMAND CAPABILITY

That is not how the Orbiter should be used in the most effective way. We don't need a manned system to launch those. We need that launch-on-demand capability.

Senator **Garn**. You would agree launch-on-demand is a little bit misleading?

Mr. **Aldridge**. It is launch on demand in the sense we need to launch as quickly as we can, as rapidly as we can. We believe if we have an expendable launch vehicle tied to a particular satellite, it is easier for us to launch that satellite on demand than having to go kick somebody off a shuttle, bring it back in the bay, reintegrate that particular satellite and get it off the ground.

We have a requirement for NASA to do that in 120 days. We have never demonstrated that and hopefully we will never have to, but that is a requirement we have with NASA. We can do that with the ELV in about 60 days.

Senator **Garn**. You saw NASA launch two shuttles within 17 days?

Mr. **Aldridge**. No, sir. The shuttle that was launched sat on the ground for 5 months. It just happened we got them out in 17 days.

Senator **Garn**. The turnaround time at the pad you saw was less than 4 weeks. One mission canceled and combined with another. The heat shield was taken off, it was replaced.

The country did not suffer. It would be nice for NASA to fill some of the holes in the communications.

DOD COMMITMENT

Mr. **Aldridge**. In [deleted] we will begin to suffer if there are not two [deleted]. They have to be launched within the next year. What we were trying to do with this agreement is to get this turf battle behind us. There was somewhat of a turf battle, but Jim Beggs and I agreed, DOD, signed by the President that we would commit to one-third.

Independent of the ELV's that we would launch, we will commit to one-third. I believe we are going to see not one-third. I believe the demand will get higher than 8 per year. I think we will get 10 per year.

Senator Rudman. Would you yield for one moment?

Senator Garn. Sure.

Senator Rudman. I have to tell you in this city we do the most marvelous things with the English language. Let me read your agreement. This is what really irks me. I have the agreement the President signed. I will state this and yield back to my friend from Utah.

It says: "DOD will rely on the STS as its primary launch vehicle and will commit to at least one-third of the STS flights in the next 10 years."

That is a contradiction. If something is primary——

Mr. Aldridge. It does not say exclusive. It says primary and it will be primary. We will fly eight missions a year on the shuttle and two on the ELV.

Senator Rudman. It says, "commit to at least one-third of the STS flights."

Senator Stevens. The key question is what do the eight cost and what do the two cost. That is what we are trying to find out.

Mr. Aldridge. The issue is that we pay a certain agreed price per flight for those eight. Right now we are paying $54 million per flight, a certain amount of dollars.

The reason for that price as opposed to some other price is because that does not include a prorated cost share of NASA's operating cost and a prorated cost share of the Vandenberg operating cost for the Orbiter.

We plan to fly the eight and it is part of the agreement that NASA will agree to the two ELV's per year. In order that we could get on with the requirement for the future, we both recognized that there was a requirement that we get on with a new capability for the future that would support SDI, would support a space station and would support satellites that will grow beyond the 10,000 pounds to geosynchronous orbit.

However, in our joint study we could not identify these requirements beyond 10,000 pounds until after the mid-1990's, far beyond the time the 10 ELV's would be used up.

SECOND GENERATION STS

What we agreed to do is get on with a set of joint studies to look at a second generation space transportation system—it does not say second generation shuttle—a second generation space transportation system that would consist of manned and unmanned vehicles.

Jesse and I jointly share a commitment to do that study so that we can look to the future with these new technologies.

SRB-X will not compete in the time frame to meet our requirements compared to Titan 34D7 or modified Atlas.

BEST

We did a competitive study. There was no prior buy. I was the source selection authority on that. We went through every single step as we would do in any competitive procurement and the Titan 34D7 won fair and square, less cost, less risk, a fixed-price contract, compared to the SRB-X.

Yes; it was not an advanced technology system, but it met the requirements, it did not exceed the requirements. An analogy would be my walking before any committee of Congress saying:

> I have a brand new idea for a great weapons system for the future. It has all this great growth potential, but in fact the current weapon system works just fine, but I really would like this new capability.

There is no requirement for it. We think the Titan 34D7 meets our existing requirement quite well and meets the launch rate we need.

On the fifth Orbiter, $2 billion for ELV buys ELV's and 10 launches; $2 billion for the Orbiter launches buys you nothing. You still have to pay for the 10 flights on the Orbiter plus the cost of the flight.

When you compare the cost to get 10 vehicles in orbit, you know, you can't compare the two. ELV should not compete with another Orbiter plus the fact, no matter if you have 5, 6, or 7 Orbiters, if they were completely grounded for some technical reason for 6 months, 2 months, any number of times, there is no capacity at all to get to space.

Senator **Garn**. We are getting off the subject again.

LAUNCH BACKUP

I don't disagree with the backup. If that happens, that is what the backup means to me.

You are talking about buying 10 Titans at $2 billion and using them?

Mr. **Aldridge**. Yes, sir.

Senator **Garn**. Regardless of whether the shuttle could carry them or not. I am saying the shuttle should take every one in hand. If all the dire things happen that you say are going to happen with the shuttle, the monkeys throw up and put it out of commission and foul up the avionics, or whatever, then you use your ELV's.

Mr. **Aldridge**. Sir, you cannot do that.

Senator **Garn**. Why not?

Mr. **Aldridge**. What you have done is forced us to buy two launch rides for every satellite. I have to pay NASA to fly the Orbiter and I have to buy the ELV's to back it up. No longer must I do that.

I have to keep a standing army around to launch the Titan 34D in case I have to call them up.

Senator **Garn**. You have them around to launch them, to begin with.

Mr. **Aldridge**. No, sir, they are gone after 1988. The launch team is dissolved in 1988 unless we get a decision on launch capacity beyond 1988, which is what this 10-vehicle buy is for.

Senator **Garn**. Now you confuse me more because you are saying the launch team is going to be gone and you have no capability at that point.

Mr. **Aldridge**. Yes, sir, unless we get the ELV's, and we just can't go buy them, put them in the barn and hope we can pull them out of the barn in any given time and have a launch team available with all the components, the facilities that are currently in existence at Kennedy, which is the launch complex adjacent to the launch complex 39.

We plan to use launch complex 41 which is there now and maintain the team to be prepared to launch.

Senator **Garn**. It will be gone in any event.

Mr. **Aldridge**. No, sir, that is the launch complex we will use for the 10 ELV's.

Senator **Garn**. You are talking about the time you would lose it.

Mr. **Aldridge**. Without continued production of the Titan 34 missile, the production capacity is drying up. They are beginning to phase down the entire production capacity unless we can get the reprogramming through and get the budget agreed to for the ELV.

Then we will continue that production rate through 1992 which is the 10-vehicle buy.

Senator **Garn**. I am far beyond my time. I have more questions, Mr. Chairman, but I don't want to dominate all the time. I will turn it back to you.

Senator **Stevens**. I have the same feeling.

Senator D'Amato.

Senator **D'Amato**. I will not attempt at this point to enter into the discussion. I would like to submit questions for the record.

CELV COSTS

Senator **Stevens**. I am getting the calculations now, but I figure roughly, and depending on what is going to happen here today, there is a $50 billion difference in the availability of funding for the Department over a 3-year period based on the decision.

It is almost $20 billion in the first year and 1987 and 1988 compounds that. It is about $50 billion, at least, loss of funds.

You are about ready to embark on a new $2 billion expenditure which if we look at the Department's blend of funding, we have to assume about a third of the loss of $50 billion will come out of the Air Force.

You want a $2 billion increase in this area, a brand new funding commitment on an incremental basis. I think you are going to have to really take another look at this.

If we give you that $2 billion, it means we cut $2 billion more from tactical fighters or bombers or something else.

I know you presented this to us at the time when you thought you would not have to face that. We have come all the way down to zero and have a zero basis. I think we are going to have a zero basis for at least 3 years.

I don't see how you can contemplate starting $2 billion of new programs at a time when you are going to lose probably $16 to $17 billion out of your projected expenditures for the next 3 years.

It weighs against SDI, against ATB, against the ATF, it weights against the whole panorama of new Air Force programs. You have to tell us if this is your number one priority.

I agree with Jake, I don't view it this way. I think you have solved the turf battle at the cost of $2 billion and I can't figure out yet what the cost would have been if you didn't have the turf battle.

Mr. ALDRIDGE. $2 billion is over a period of 5 or 6 years, not in the near-term time frame.

Senator STEVENS. If you think we are going to get a springboard in 1988 and get back up to where we were I looked under my pillow this morning again and I looked under it yesterday morning, the tooth was still there.

Mr. ALDRIDGE. I would put the argument in the context of the total system. We are not just talking about the launcher which seems to be the focus.

We are talking about the delivery, the top priority, Defense Department payloads to orbit. We are going to do that in a way we believe is the most efficient way possible.

If the budget is cut to the numbers that you specify, I will almost guarantee those satellites that are being put in that budget will not be part of the cut that will come forth to make up those differences in dollars.

Senator STEVENS. I take that as a given. You are right, we cannot let down on that.

Mr. ALDRIDGE. As the launcher of those satellites, I have to determine the most effective and most reliable way to launch those satellites, using either the Shuttle which we will use for 80 percent of our satellites or using the ELV's on which the difference is $17 million or $25 million a copy, that is about 10 percent of the cost of the satellites that we are delivering. It is worth the cost to get those essential satellites in orbit when we need them in orbit.

ELV VS. ORBITER COST

Senator STEVENS. We figured that you have about $1.7 billion in common costs. It will be there no matter which system you use. We are looking at $1.3 billion incremental increase by going to the CELV route.

Do you argue with that?

Mr. ALDRIDGE. The additional cost to fly on the ELV versus the cost of flying on the Orbiter from a point of view of the taxpayers' cost is about $25 million a flight, based upon taking the $17 million and escalating it.

Senator STEVENS. You are talking about $250 million, but your program is $2.1 billion. Your differential cost is $17.6 million.

Mr. ALDRIDGE. Part of the $2 billion has been offset by decreasing the price that we would have paid NASA for those two additional flights. That is a cost avoidance. We do not have to now pay the $84 million, the taxpayer does not have to pay the $84 million per flight to NASA to fly those same payloads.

Senator STEVENS. We have the idea that if NASA were on a private economy basis, it would be bankrupt because it is not fulfilling

BEST C

its uses as much as it should. That is what CBO tells us, as you know.

Mr. **Aldridge**. We got into the discussion the other day about what does it cost to fly the Orbiter. It runs from marginal cost to full cost. Numbers run from one end of the spectrum to the other.

The number we have centered on today is that the cost to fly the Orbiter in constant dollar terms is $84 million. We say the cost to fly an ELV is about $100 million. Let us say at 1982 dollars for the time frame. That means the differential cost is $17 million per flight.

So, the cost to the taxpayer for flying these ELVs is 10 times $17 million, $170 million. Those 10 satellites we are launching are probably on the order of $3 to $4 billion of the highest priority satellites.

I believe that cost of $170 million is worth that extra bit to assure we can get there is spite of the uncertainties that would exist with regard to flight rates or grounding or any other contingency that might exist.

CRITICAL LAUNCH DATE

Senator **Stevens**. One last question.

How critical is that 1988 initial launch capability?

Mr. **Aldridge**. That is the date for the [deleted] and it is critical.

Senator **Stevens**. You can't rely on NASA for that?

Mr. **Aldridge**. You could rely on NASA for that. Without the ELV we would have to totally rely on NASA for that. We are saying it is better for us to have a complementary system. In order to have the complementary system, we believe it is best for us to fly a small number of them.

In case we would have some problem with the shuttle, we hope to heaven we don't have, in case the flight rate cannot be achieved for either 24, we can't get the 24, it is 20 or we have to ground for some period of time or if we bang one up and have it go out of the inventory, we have lost 25 percent of our launch capacity.

Senator **Stevens**. I have to tell you, Mr. Secretary, I think that admittedly the payloads you have, we have to agree, are the most critical for the future of this country. They have to be launched at all costs in spite of the costs.

I don't think you have made a case that we have to incur this cost now for a separate launch vehicle system.

PRODUCTION CAPACITY

Mr. **Aldridge**. If we do not keep the production open—that is the issue—that production capacity of this expendable launch vehicle that would give us that complement, if they are not approved now, that industry stops.

Martin-Marietta begins to phase out their subcontractors and they will no longer have the capacity unless we want to spend a lot more money to rebuild that production base a year from now or 2 years from now.

That is not economical.

Senator **Stevens**. That is an important consideration, I concede.

Senator **Garn**. May I just ask one question?

We approve the reprogramming, does that then lock us into the whole thing?

Mr. **Aldridge**. No, sir.

NEED FOR FURTHER STUDY

Senator **Garn**. If I decide to go ahead and vote for this reprogramming, it would only be on the basis that I have an opportunity to study this much more carefully for the 1986 budget?

Mr. **Aldridge**. Yes, sir, you do.

Senator **Garn**. You guarantee me that that is the case?

Mr. **Aldridge**. Yes, sir.

Senator **Garn**. We are not going to come back and hear now we are locked into this, we approved it, and we can't change it?

INCREMENTAL VS. FULL FUNDING

Mr. **Aldridge**. No, sir. I know there is an issue incremental versus full funding. That 1986 issue has nothing to do with 1985 because that is all research and development.

The 1986 issue, I believe we have $185.9 million in for research and development that is not associated with incremental versus full funding.

We think incremental funding is the best approach. It saves $400 million to the taxpayer. But we can address that. The 1986 issue has nothing to do with the 1985 reprogramming. The 1985 reprogramming allows Martin-Marietta to keep the subcontractors alive and keep alive the design of that particular vehicle and assure we minimize the risk.

Senator **Rudman**. Mr. Chairman.

Senator **Stevens**. Senator Rudman.

Senator **Rudman**. Mr. Secretary, I have no doubt of your sincerity and of your intentions here. They are not in question.

I have to tell you that I think this is a classic camel's nose under the tent project as far as I am concerned. No question about that.

The Air Force has its space command out in California and in Colorado Springs. They are probably necessary to some extent. We are heading toward a dual track space delivery system.

If you were to say to us, look, we can't always depend on NASA, there are all kinds of problems and we need to spend a couple billion dollars to have our own system, I would say that is true.

You say, however, we are going to build these 10 vehicles, this will be the emergency reserve. That is like the infantry hiding the last box of mortars in the bunker to be used if everything else is gone.

I think if you want to get these things, you ought to make a proposal that says, look, we are going to build some vehicles over a 5- or 6-year period and we are going to put them in position.

You start telling me you are going to close down your launch crew. I don't buy that. I have seen the NASA budget. Quite frankly, on the morning you launch these things you are going to change uniforms.

We are paying a bloody fortune for launch crews at Kennedy. The American people have had it with the Defense budget. I have voted for it right down the line. They are going to go zero this year and maybe worse next year if recession hits.

All I am telling you is that all of us have a responsibility to turn the last screw to get the last dime out of the system. I don't think you are doing that. You may be trying, but I don't think you are. That is how I feel about it.

LAUNCH COMPLEXITY

Mr. **ALDRIDGE**. I think you are underestimating the complexity of getting space vehicles launched. You cannot just pull a launch team out of the the building at Cape Kennedy or Johnson and put them over the launch complex 41, the Titan facility, and have them light up one of these rockets. It is a far, far more complex problem to get that missile off the ground, to make sure the payload is integrated, has all the software packages on it to make sure you have the right orbit at the right time.

It is a far, far more complex job. It takes right now about 600 people to launch a Titan 34D7 and that would be the kind of crew you would have to maintain at the launch base.

Senator **RUDMAN**. Even for the contractors?

Mr. **ALDRIDGE**. It has to do with contractors, a great majority of it is contractors. There are a lot of blue suit people there, too. Those are the technical people that have built that spacecraft vehicle and the payloads associated with it.

It takes 6,000 people to launch an Orbiter, roughly at Kennedy. It is a very, very complex problem.

CRISIS STANDBY

Senator **RUDMAN**. I don't have any doubt about that whatsoever. I am saying with the kind of crisis we are faced with, we ought to build some of the standby vehicles. I don't argue with that at all. I don't think we ought to use them until we have to. I think we have to find a way to deal with the problem.

I can't believe that this Government and these services and that agency can't find a way to deal with this problem. I don't believe that.

CAMEL'S NOSE UNDER THE TENT

Mr. **ALDRIDGE**. Let me address also the question of the camel's nose under the tent.

It may be, but that will be based upon the process that we are going through right now. I can't buy more than 10 vehicles unless I get congressional approval to do so.

The only way we will come over to any committee and get the President to agree to change our agreement with NASA which has to be done and the President has to agree to any changes—would be if there were some national emergency, and the shuttle was grounded for a period of years or it couldn't meet the flight rate of 24 flights per year so that we needed those ELV's for some reason. Only under those conditions would I come before the Congress and request additional ELV's be bought.

The authority to give me those funds obviously belongs to Congress before I can go procure them.

Senator **Stevens**. I like to admit errors, but not this one. Charlie has checked my guesstimate and I was just 300 percent off.

At a zero real growth for 3 years compared to the President's original budget on a basis of 3 percent per year, the loss of the zero-zero-zero budget over 3 years is $167.4 billion for DOD. It is a $50 billion loss to the Air Force.

Senator **Rudman**. In light of that, I repeat all I have said and that is all I have to say.

Senator **Stevens**. We don't know how we can find you that money. We understand you have to have Martin-Marietta. We understand you have to have a standby.

We don't understand why you have to fly two a year just to prove you have a standby.

Mr. **Aldridge**. The satellite is more than a standby. It is not an insurance policy. It also removes the launch on demand pressure from NASA to allow them to not have this bumping privilege over their back for those critical satellites which I hope will encourage more users to come onboard the shuttle.

REPROGRAMMING APPROVAL

Senator **Stevens**. We have a vote on. I will recommend to the committee we approve the reprogramming with the complete understanding in the record we are making no commitment to the $2.1 billion. We just have to think about that. We can't hold up on the $30 million.

Senator **Rudman**. I am not sure I am going to vote for that.

POLICY NEEDS

Senator **Garn**. Let me make one closing argument. I had a lot of questions I wanted to ask both of you.

In my other hat, Mr. Chairman, independent agencies, we are going to have another hearing. I am only a member of this committee. I do feel it is absolutely necessary that we go into this in a lot more detail than we have today. I have a lot of questions for both sides.

I agree with Senator Rudman this is just a far bigger decision than a couple billion dollars. I don't mean to minimize the importance of $2 billion is the problem of the budget.

We are dealing with basic policy here between two agencies of national security. I don't think most people have really looked into that carefully.

With my other hat in the other subcommittee, we will schedule another hearing. I would like it closed so that we don't have to worry about national security. I will invite members of this subcommittee to join in that, and I will give you enough time to really dig into it in much more detail.

NASA BACKUP CAPABILITY

Senator **Stevens**. One last question while we have NASA here.

Did you ever figure out what it would cost you to maintain the standby capacity that the Air Force needs?

Mr. **MOORE**. Mr. Chairman, we have a capability that is in our program to launch on demand a requirement of 120 days.

Senator **STEVENS**. I am talking about using these Titan 34D7s.

Mr. **MOORE**. No, sir, none of our plans for the 24 flights per year include a standby, holding an Orbiter on standby waiting for a launch, if that is the essence of your question.

Senator **STEVENS**. The Secretary has to refurbish a whole facility over there in order to have this standby capacity. That would not be available under your existing system; is that correct?

Mr. **MOORE**. That standby capacity is not available under the NASA system at this point in time. We are planning on flying 24 flights a year. It is a regular operating flight schedule we are planning on. We have told the Air Force we can respond to a launch on demand within 120 days.

Senator **STEVENS**. That is not demand enough. I understand what he is talking about and I think you do, too.

The real problem is what it would cost you with all the facilities and the crew you maintain to accomplish the same result assuming we could have the hardware, it is a standby manpower that is really going to bug us in the long run under your selection, Mr. Secretary.

Mr. **ALDRIDGE**. The facility there that exists at the Cape Canavernal Air Force Station is designed to launch the Titan 34D. It is independent of the shuttle launch complex.

Senator **STEVENS**. I understand. That is a tremendous labor-intensive standby capability.

Mr. **ALDRIDGE**. Six hundred people per launch, to launch the Titan 34D7.

SUBMITTED QUESTIONS

Senator **STEVENS**. Thank you, Mr. Aldridge. The committee has additional questions which we will submit for your response.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

BES

ADDITIONAL COMMITTEE QUESTIONS

DSP AND THE CELV REPROGRAMMING REQUEST

QUESTION: What would be the impact on the DSP program if the Air Force reprogramming request for $30 million in R&D funds this year were not approved? What kind of delay would result?

ANSWER: [Deleted].

This launch is part of a replenishment with upgraded capabilities following a deployment gap of approximately two years (CY 1985-87). The importance is such that we have incentivized the CELV contractor for earlier delivery in anticipation of an earlier need date. Should a situation occur wherein the Shuttle was not available for a period of time, the CELV would provide our only access to space for this mission. Denial of the reprogramming would delay the launch capability by the number of months required until enactment of the FY 1986 appropriation. This would add to an existing gap of almost 9 months without a complementary capability and would present an unacceptable national security risk.

IMPACT OF RELYING SOLELY ON THE SHUTTLE

QUESTION: What would be the national security impact of relying solely on the Shuttle to deliver critical DoD heavy-weight payloads for an additional year or so?

ANSWER: The October 1988 schedule requirement for CELV is firm. This requirement is because the last Titan 34D launch from Cape Canaveral is scheduled for January 1988. After this launch, the only launch system available is the Shuttle. It is during this timeframe that DoD is most concerned that an alternative launch system is not available to support its top priority payloads. A measure of importance which DoD ascribes to this factor is the CELV contract which includes an incentive of $50,000/day for early delivery and a penalty of approximately $100,000/day for late delivery of the first launch. [Deleted].

Equally important, delays in defining the launch system adversely affect satellite deliveries. As a part of the 4 to 6 year satellite design and manufacture process, the launch vehicle must be defined early in the design cycle to properly configure the satellite to its launch vehicle and launch environment. Where satellite redesign caused by changing launch vehicles can be extremely expensive, making the change in conjunction with a block change can minimize this cost. [Deleted].

If the expendable launch vehicle is not selected prior to this design freeze, provisions for dual (Shuttle and CELV) compatibility would cause schedule delays and increased costs due to redesign.

CELV INCREMENTAL FUNDING

QUESTION: The Air Force proposal for incremental funding of the CELV program is unusual to say the least. Why did the Air Force pick this route?

BEST [illegible]

Answer: The issue of full versus incremental funding for the $1.2 billion procurement segment of the $2.1 billion CELV acquisition was deliberated exhaustively during formulation of the FY 86 President's Budget, and was approved by the Deputy Secretary of Defense.

Incremental funding is proposed for the following reasons: First, the CELV program is a support system to provide a launch capability for well defined, stable, and validated national security satellite programs. Each of the selected satellites is far into design and/or production, and there is virtually no question that they will be launched and the CELV boosters will be used as scheduled. With this certainty of the requirement, the CELVs should be acquired as economically as possible. One approach is full funding of ten vehicles in the FY 86 budget. The probability that the large block of procurement dollars required for this approach will be accommodated in FY 86 is not very high. Therefore, the most likely full funded profiles would be at a build rate of 2/4/4 CELVs in FYs 86, 87 and 88; or, at a build rate of two vehicles per year for FYs 86 through 90. Both of these options are more expensive than the incrementally funded buy now on contract and requested of the Congress. The 2/4/4 full funded program would cost approximately $145M more than the incremental approach and would require accelerating more than $450M into the FYs 86-88 budgets over the amount currently requested. The low probability of gaining these accelerated funds would most likely force a two per year, fully funded build rate. The inefficiencies of this rate would cost more than $400M over the incrementally funded program.

Therefore, the DOD deliberated the trade-offs of incremental and full funding, and recommended incremental funding. If full funding is directed against the current contract (2/4/4 build rate across FY 86/87/88), the price will increase by an estimated $145M. If budget pressures cause a full funding at a two per year build rate, the CELV contract price will increase by over $400 million. The Air Force has evaluated the funding issue in great detail and strongly requests Congressional approval of incremental funding as the most economic means for providing a vital launch capability for critical national security satellite programs.

LONG TERM COMMITMENT FOR CELV INCREMENTAL FUNDING

QUESTION: Incremental funding involves a commitment to a 10 year, $2.1 billion program that would be expensive and wasteful to terminate later on. With the uncertainties of Shuttle pricing and the already heavy Air Force commitment to the Shuttle, how can you justify such a long term commitment? What options would Congress have in future years if the full program were deemed to be unnecessary?

ANSWER: The period of performance on the CELV contract is 28 February 1985 - 30 September 1993, an eight year, seven month effort. Production will be completed in FY 1990, and the last launch is forecasted for FY 1993. The contract is incrementally funded to termination liability, meaning that if a decision is made to terminate the contract, no additional costs will be incurred.

The cost for assured access to space is not $2.1 billion. At most, the cost for assured access is about $282 million and depending on the uncertainties of outyear Shuttle costs, it may even result in a savings. If we don't fly the ten missions on the CELV, we must fly them on the Shuttle. Therefore, the real cost of the CELV program to the nation is the dif[illegible] between what it would cost to fly the ten missions on the CELV and the cost to fly the same ten missions on the Shuttle. That difference, as shown below, is $282 million.

CELV COST TO NATION
(THEN-YEAR DOLLARS IN BILLIONS)

CELV CONTRACT COST	$ 2.097
LESS CENTAURS (10)*	-.595
LESS CURRENT SHUTTLE FLIGHT CHARGE	-.795
SUBTOTAL	$ .707
LESS POTENTIAL ADDITIONAL FOR "FULL COST RECOVERY"**	-.425
	$ .282

*Approximate

**Based on NASA stated full cost recovery (NASA 24 Apr 85 Ltr) of $87 million (FY 82 $). This cost is within 3% of the cost accepted by the March 1985 Congressional Budget Office Report on pricing Options for the Space Shuttle.

The Air Force's heavy commitment to the Shuttle is based on the quantity of approved satellite programs needing launch. Likewise, the CELV is being acquired to launch the highest priority DoD satellites. The CELV is a direct support element of these national security satellites and as a result is programmed to be acquired in the most economical way possible.

Congress still has the option to decrease quantities or cancel the program in future years. Although the current contract calls for the incremental funding of ten CELVs, the contractor's effective build rate for the system is 2/4/4 in FYs 86/87/88, respectively.

NORMAL PROCUREMENT APPROACH TO CELV

QUESTION: What if Congress elected to follow the normal procurement approach to CELV? What impact would that have on other Air Force programs in a constrained budget situation?

ANSWER: As depicted in the following funding profiles, the incrementally funded CELV contract, which allows for maximum production efficiency, is an estimated $144M-$419M less costly than the more traditional annual buy approaches. Moreover, the annual buy approaches require a substantially greater "front-loading" of funds than the smoothed incremental approach.

CELV COMPARISON: INCREMENTAL FUNDING VERSUS FULL FUNDING
DETAIL BY APPROPRIATION

INCREMENTAL FUNDING - CURRENT CONTRACT*
(10 DELIVERIES; BUILD RATE: 2/4/4)

	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	TOTAL
RDT&E	35	249	116	30	2	-	-	-	-	432
PROCUREMENT	-	232(10)	297	309	153	83	45	28	-	1,147
O&M	-	-	-	-	115	144	125	87	46	517
TOTAL	35	481*	413	339	270	227	170	115	46	2,096

* DUE TO BUDGET CONSTRAINTS, THE CELV CONTRACT WILL BE REALIGNED TO FALL WITHIN THE FY86 BUDGET.

FULL FUNDING
(2 DELIVERIES; BUILD RATE: 2/4/4)

	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	TOTAL
RDT&E	35	249	116	30	2	-	-	-	-	432
PROCUREMENT	-	285(2)	491(4)	515(4)	-	-	-	-	-	1291
O&M	-	-	-	-	115	144	125	87	46	517
TOTAL	35	534	607	545	117	144	125	87	46	2,240

FULL FUNDING - FISCALLY CONSTRAINED TO 2/YR
(2 DELIVERIES; BUILD RATE: 2/2/2/2/2)

	FY85	FY86	FY87	FY88	FY89	FY90	FY91	FY92	FY93	TOTAL
RDT&E	35	249	116	30	2	-	-	-	-	432
PROCUREMENT	-	285	299	314	329	339	-	-	-	1,566
O&M	-	-	-	-	115	144	125	87	46	517
TOTAL	35	534	415	344	446	483	125	87	46	2,515

CONTRACT FOR LAUNCH SERVICES

QUESTION: Why is Air Force planning to contract for launch services? Does this save money? What are all the benefits?

ANSWER: Historically, the Air Force has contracted for launch services. We have used launch teams made up primarily of military personnel in the past. However, while Air Force launch crews were fully as capable as civilian contractor teams, military rotation, retention, and training factors made this concept less desirable and more costly over the long run. Under the current CELV contract, the contractor has total system performance responsiblity from design, through production and launch. This continuity of effort, obtained through the competitive process, provides the most reliable and cost effective means of launching our space systems.

COST TO IMPROVE THE TITAN SYSTEM

QUESTION: Development of the Titan 34D7 is estimated at $432 million. Why does it cost so much to improve the Titan system for the CELV program?

ANSWER: The actual CELV development is comprised of $282 million for upgrading the design of the Titan 34D, and $145 million for modifying the Centaur G-Prime and integrating it with the Titan 34D7. Considering that this development essentially doubles the current Titan's capability to deliver payloads to geosyncronous orbit and matches the Shuttle's capability which cost billions to develop, these costs are relatively small. Though the development of the CELV is considered relatively low risk, there are several components of the existing Titan 34D and Centaur which require redesign. For example, the Titan solid rocket motors will be increased from 5 1/2 segments to 7 segments; the payload fairing will be increased from 10 feet to 16.7 feet in diameter; the core vehicle will be stretched for greater performance; the interstage adapter will be strengthened to accommodate added stresses; the Centaur G-Prime upper stage, currently designed to launch with the Shuttle, will require integration with the CELV; and an existing Titan launch complex at Cape Canaveral Air Force Station, Florida, will be reactivated and modified for the CELV. The development will require several subsystems tests, and although a flight test is not planned, a complete ground systems test is planned which effectively involves the use of a full vehicle equivalent set of hardware as a part of the development.

TITAN 34D7 GROWTH POTENTIAL

QUESTION: Does the Titan 34D7 have growth potential for future requirements?

ANSWER: Yes. Growth versions of the Titan III launch vehicles have been examined several times in recent years. Most recently, a joint NASA/DoD/OMB study confirmed that the Titan 34D7 has a substantial growth capability. While the study found no requirement which would exceed the Shuttle/CELV payload capability of 10,000 pounds to geosynchronous orbit, until after the mid-1990s, growth versions of the Titan would be able to expand in discreet steps to deliver payloads almost four times as heavy should unforeseen growth requirements materialize in the future. A detailed description of each of the vehicles can be found in the February 1985 Complementary Expendable Launch Vehicle Report to Congress.

TOTAL AF COST PROJECTIONS

QUESTION: Please review for the Committee the total Air Force space program cost projections for the period covered by the CELV program--not only launch costs but the estimated price for the various payload systems you want orbited.

ANSWER: The Air Force Budget for the CELV program and the payloads it launches are (in then year dollars).

CELV	$2,173 million	(10 launches)
Milstar	1,200 million	(2 launches)
DSP	1,907 million	(5 launches)

CELV costs include launch support costs. Three classified payload costs have been furnished separately through appropriate channels. Their launch support costs are, however, shown.

AFFORDABILITY OF SPACE PROGRAMS

QUESTION: How do these large program costs mesh into the current constrained budget outlook? In other words, how affordable are they in light of the other expensive Air Force initiatives (MX, ATB, Midgetman, ATF, etc)?

ANSWER: In structuring the Fiscal Year 1986 President's Budget for space programs, the Air Force prepared a balanced program to maintain current capabilities, while adding critical mission enhancements and survivability features. Space programs support both strategic and conventional forces by providing global cost-effective, support capabilities for a broad spectrum of DOD missions. Spaceborne surveillance, warning, communications, meteorological and navigation systems significantly increase the effectiveness of our forces today, and we fully expect these spaceborne capabilities to become even more important to our forces in the future (Peacekeeper, B-1, ATF, SICBM, etc).

FY 85 & FY 86 BUDGETED AMOUNT FOR SHUTTLE LAUNCHES

QUESTION: Secretary Aldridge, how much is the Air Force budgeting in 1985 and 1986 for Shuttle launches and what portion of that budget is reimbursable to NASA and what portion is for direct Air Force costs?

ANSWER: The amounts budgeted by the Air Force for Shuttle flight charges, upper stages, and operations costs are as follows:

AIR FORCE SHUTTLE COSTS ($ MILLIONS)

	FY 85	FY 86
Reimbursable to NASA	836	639
Direct Air Force Costs	765	754
Totals	1601	1393

TITAN BOOSTER CONVERSION

QUESTION: This year's R&D budget includes $7 million to start refurbishing our old Titan II ICBM boosters for use as space launch vehicles for small payloads of 2,000 pounds or less, such as DMSP (Defense Meteorological Satellite Program). Some Air Force payloads will be put on the Titan III's and taken off the Space Shuttle.

How will use of Titan II boosters impact on the Space Shuttle program?

ANSWER: The 13 payloads scheduled to be launched on Titan IIs each comprise about 10 percent of one Shuttle flight's payload carrying capacity. Thus, the loss of payloads to the Shuttle in terms of capacity is very small. Furthermore, the DoD launch model presently predicts about 3-4 launches per year from Vandenberg after the Titan II launches have been factored out. Added to these 3-4 firm launches would be any NASA and commercial launches which might require Vandenberg. Vandenberg launch capacity is only 4 launches per year. Thus, it appears the Shuttle capacity from Vandenberg will be well utilized.

COST EFFECTIVENESS OF TITAN II BOOSTERS

QUESTION: Is the use of Titan II boosters for small DoD payloads more cost-effective than use of the Shuttle? How does the cost per launch compare, Titan II versus the Shuttle?

ANSWER: Use of the Titan II is indeed more efficient than the Shuttle for small launch-on-demand satellites with unique polar orbits. Satellites with these characteristics will likely fly alone in the orbiter, using a fraction of the payload bay and not need the unique capabilities of man in space. Additionally, these existing satellites would have to be redesigned to fly on the Shuttle, entailing added costs. Our projection for the Titan II refurbishment and launch costs is $30 million (FY 1985 dollars) per launch, plus a one time cost of $65 million to develop the Titan II missile into a space launch vehicle. Current estimates of Shuttle launch costs are considerably higher than the above.

CONVERTING THE TITAN II

QUESTION: General Kutyna, when did the Air Force actually begin design and development activity on converting the Titan II into a launch vehicle for DMSP?

ANSWER: The only activities underway at the present time for the Titan II are the deactivation and storage of the ICBMs. Initial funding for the conversion to a space launch vehicle is contained in the FY 1986 RDT&E request.

DMSP TRANSITION TO THE TITAN II

QUESTION: When will DMSP satellites ultimately transition to the Titan II? Is that an urgent requirement, or can the transition be phased in more gradually?

ANSWER: The Defense Meteorological Satellite Program (DMSP) will transition to the Titan II with satellite S-15 in 1990. This is an urgent requirement because the last Atlas E launch vehicle allocated to DMSP is for satellite S-14. The S-15 Titan II compatible satellite must be funded at the requested level beginning in FY 1986 in order to meet its 1990 launch date. The Titan II refurbishment program must be funded at the requested level beginning in FY 1986 to support the launch requirement of a classified program in FY 1988. With no Atlas E launch vehicles remaining, the only alternative to meet S-15's 1990 launch requirement would be a more expensive and less efficient transition to the Space Shuttle. The non-recurring cost to transition S-15 to the Shuttle is $70 million (FY 1985 $), more than ten times the cost of the transition to Titan II. Further, it would not be efficient to launch the small, (approximately 2000 pounds) high priority, launch-on-demand DMSP on the Shuttle.

SHUTTLE MANIFEST

QUESTION: Mr. Moore, how will the Space Shuttle flight manifest have to be changed between now and 1993, if the Complementary ELV is not funded?

ANSWER: The National Security Decision Directive (NSDD) on National Security Launch Strategy commits the DOD to at least one third of the Shuttle launch capability beginning in FY 1989. This commitment is being discussed between NASA and DOD at 8 to 9 flights per year as a fixed launch rate base. This NSDD commitment assumed the funding of the 10 CELV's at a flight rate of 2 per year. Therefore, should the CELV's not be funded, it is reasonable to consider an appropriate adjustment to the DOD fixed launch base at 9 to 10 flights per year. With four Orbiters, two launch pads, and three mobile launch platforms, we have the flexibility to meet changing DOD requirements of this magnitude.

QUESTION: What civilian and/or NASA payloads would have to be "bumped" to make way for DOD mission payloads?

ANSWER: It is unlikely that any civilian and/or NASA payloads will have to be "bumped" in favor of DOD payloads with the launch capacity available. With the DOD commitment to fly eight to nine STS flights per year, it is envisioned that even a National Security Priority launch requirement, or a call up of a DOD Launch On Need payload, could be accommodated by one of the existing DOD launch slots and that DOD could make the necessary adjustments in their subsequent STS launch/payload manifest assignments.

QUESTION: How would DOD "bumping" of non-defense payloads off of the Shuttle effect the commitment of commercial users to the Space Shuttle?

ANSWER: It is not anticipated that any DOD "bumping" of commercial payloads will occur without sufficient warning that a commercial payload launch would be seriously impacted. Thus, this does not appear to be a conc[illegible] to the commercial users.

PRICING POLICY

QUESTION: Mr. Moore, please outline briefly the current NASA pricing policy--that is, how are costs assigned to the Air Force and to other users, and how much of the total cost is picked up by the taxpayer?

ANSWER: The objectives for the current phase pricing period (FY 1986 through FY 1988) were to avoid any additional burden to the U.S. taxpayer for foreign and commercial flights, to remain competitive and to have foreign and commercial customers contribute to the reduction of fixed costs to fly U.S. Government launches. This price was defined as "out-of-pocket" costs which was about 40 percent above marginal (additive or incremental) costs. The intent was to allow the Shuttle to gain additional experience in operations and [illegible] use a pro rata share of full operati[illegible] as the basis for pricing.

During this time, the price for a commercial or foreign Shuttle flight was $71 million. This results in a contribution of approximately $36 million above the fixed costs. Under our current agreement with the Air Force, each DOD Shuttle flight is priced at $55 million. This is based on a "quid pro quo" agreement to reflect Air Force contributions to the Shuttle program.

The final price for Air Force launches is presently being negotiated between NASA and the DOD. NASA's proposed price assuming a base of eight to nine flights per year in the Phase III pricing period (FY 89-FY 91) is $65M (FY 82$) which includes the marginal cost of $32.8M per flight.

QUESTION: What fundamental changes does NASA plan in its pricing policy for 1989 and beyond? And what are the factors that motivate these changes?

ANSWER: The President directed NASA to submit to the Senior Interagency Group (SIG) Space a plan to recover full costs for foreign and commercial Shuttle operations commencing in FY 1989. The Shuttle pricing schedule submitted to SIG Space was based on the recovery of costs for these operations in FY 1989 - 1991.

QUESTIONS SUBMITTED BY SENATOR D'AMATO

REQUIREMENTS FOR A MILITARY SPACE PLANE

QUESTION: The Air Force is once again requesting about $1 million to study the feasibility of developing a military space plane. This space plane would be used for a wide range of military missions. It is only in the conceptual stage and costs are not defined. Congress deleted funding last year.

Mr. Secretary, what are the military requirements for a manned military space plane?

ANSWER: The Air Force has defined two mission areas in space, consistent with international law and national policy. These mission areas are force enhancement, to increase the effectiveness of land, sea and air forces and space support, to launch and control space systems.

Our operating commands are responsible for determining when deficiencies or opportunities create an operational need within their defined mission areas. [Deleted].

These requirements are undergoing formal review at Headquarters Air Force. [Deleted].

It is important to note that the requirements process is mission oriented, not directed towards a specific system. The concept of a military space plane--quick reaction, earth-to-space sorties with limited payload and duration--appears to provide flexibility and responsiveness with a high degree of survivability; however, any solution to future requirements will consider alternatives. There may be better or more cost-effective means of accomplishing the required space missions with other systems, such as more numerous unmanned on-orbit assets.

This country has a significant lead in technology necessary for a military aerospace plane and preliminary analysis indicates [deleted]. Our Advanced Military Spaceflight Technology Program is designed to provide a sound basis for clarifying future alternatives. In line with the FY 85 Senate Appropriations Committee language, we have reoriented near term objectives in this program to perform in-depth mission analysis--to examine whether there are high pay-off missions, unique to this concept or which can be accomplished in a superior manner compared to alternatives. Our in-house efforts underway within Air Force Systems Command show that certain characteristics, [deleted] but these need to be examined in depth.

Finally, let me emphasize that we do not want to build a flight vehicle, only investigate appropriateness and feasibility of a military space plane to accomplish space missions of the future. The Advanced Military Spaceflight Technology program offers the means for a coordinated trade-off analysis, and validation of the technology and costs for the concept.

MISSION OF A MILITARY SPACE PLANE

QUESTION: What progress has been made in the past six months on more precisely defining the mission of a military space plane?

ANSWER: Our operating commands are responsible for determining when deficiencies or opportunities create an operational need within their defined mission areas. [Deleted].

These requirements are undergoing formal review at Headquarters Air Force. [Deleted].

The military aerospace plane concept has the potential of supporting space missions by providing a flexible, responsive, survivable and logistically supportable means of performing military activities in space. This concept provides the platform for quick reaction, earth-to-space sorties.

Our mission definition for potential payloads is underway, and nearing final validation. Since some missions can be accomplished by alternative methods, the need for this system must evolve from a utility analysis of alternatives. Our Advanced Military Spaceflight Technology Program is designed to provide this analysis and then validate supporting technologies.

NASA PRICING POLICY

QUESTION: We recognize the NASA pricing policy for 1989 and beyond is not yet defined but can you give us any idea of the direction it is taking? Will costs to the Air Force increase substantially?

ANSWER: NASA and the Air Force are in active negotiation on the pricing policy. While cost to the Air Force may rise, the full scope of the agreement has not been finalized and a reasonably accurate answer cannot be provided at this time.

SHUTTLE LAUNCH COSTS

QUESTION: Under current policy, how much of the Shuttle launch costs--both fixed and variable--are covered by the Defense Department?

ANSWER: The total cost to the Department of Defense (DoD) to launch a payload or a mission on the Space Shuttle has three components: development costs for the DoD's share of the Space Transportation System (STS), cost to DoD for the launch and flight services for Shuttles launched from the Vandenberg Launch and Landing Site (VLS), and an orbiter flight charge for materials and services expended in support of DoD missions. The development cost to the DoD for items the DoD agreed to develop for the STS program under the NASA/DoD Memorandum of Understanding will total \$5.3 billion in then year dollars through FY 1990. This is composed of design and construction of the Vandenberg Launch and Landing Site (VLS), development of the Inertial Upper Stage (IUS) and a share of the development costs of the Centaur Upper Stage, development and acquisition of the capability to support classified DoD missions from NASA facilities, and other STS related development items. The exchange between DoD and NASA for launch and flight operations is defined in the NASA/AF Memorandum of Agreement on Reimbursement. Under this agreement the DoD will provide standard launch support services for all payloads and missions (including non-DoD) flown from VLS, NASA will provide standard launch services for all DoD payloads and missions flown from Kennedy Space Center, and neither will charge the other for

BEST COPY

manpower costs expended in support of the other's missions. This is known as the "Quid Pro Quo" agreement. The final element of the Shuttle launch cost is the orbiter flight charge paid by DoD to NASA for each DoD mission on the Shuttle. Under the current reimbursement policy for FY 1986-1988, that price is $29.8 million in FY 1975 dollars ($68.0 million in FY 86 dollars).

DOD SHARE OF SHUTTLE COSTS

QUESTION: Is the Defense Department going to be expected to pick up a larger share of the Shuttle costs in 1989 and beyond? Why?

ANSWER: The DoD is currently paying a fair share of the Shuttle costs based on its planned usage of the Shuttle. The DoD's share is defined by the NASA/DoD Memorandum of Understanding on Management and Operation of the Space Transportation System (STS) and the NASA/Air Force Memorandum of Agreement on Reimbursement of Launch and Associated Services for Uses of the Space Shuttle. The DoD share is composed of specific STS assets developed by DoD, the DoD portion of the Quid Pro Quo Agreement and flight charge reimbursements to NASA for each DoD payload or mission flown on the Space Shuttle. The flight charge is currently set at $29.8 million (FY 75 dollars) through FY 88 and DoD is negotiating with NASA on the charge for FY 89 and beyond. The DoD anticipates that by 1989 the STS will be a mature, operational system and costs will remain at the current level, with adjustment for inflation, or drop slightly due to the growing experience level in the production and operation of the system. The Air Force does not expect to increase our share of Shuttle costs.

RECURRING COSTS

QUESTION: What will be the recurring cost associated with launching Air Force payloads from the Complementary ELV?

ANSWER: The average unit price of the CELV, which includes the Centaur G-Prime upper stage, is $115 million in then year dollars. The average CELV flyaway price, to include launch services of both the Titan 34D7 and Centaur G-Prime, is $165 million.

ADDITIONAL COSTS

QUESTION: What would be the additional costs to the Air Force associated with launching these ten payloads from the Shuttle if the ELV program is not approved?

ANSWER: As shown in the following Table, if the CELV program is not approved, the cost to the Government of launching the ten payloads on the Shuttle will be $282 million less than the $2.1 billion total cost of the CELV, or approximately $1.8 billion. In other words, the cost to the nation for the assured access to space provided by the CELV is $282 million. This is considerably less than the $2.1 billion contract cost which has, in some instances, been erroneously interpreted as the CELV cost to the nation.

The cost to the Air Force of launching on Shuttle is dependent upon the price NASA charges the DoD for Shuttle launches. The current NASA pricing policy for DoD Shuttle flights is effective for flights through 1988. NASA is currently formulating a proposed pricing policy for flights beyond that timeframe.

However, as the table indicates, if the current flight charge was extended beyond 1988 (which is the timeframe the Air Force plans to launch the ten CELVs), the Air Force cost for launching ten Shuttle/Centaurs would be the the total of ten Centaurs ($.595 billion) plus ten Shuttle flights ($.795 billion), or approximately $1.4 billion.

CELV COST TO NATION
(THEN-YEAR DOLLARS IN BILLIONS)

CELV CONTRACT COST	$ 2.097
LESS CENTAURS (10)*	-.595
LESS CURRENT SHUTTLE FLIGHT CHARGE	-.795
SUBTOTAL	$ .707
LESS POTENTIAL ADDITIONAL FOR "FULL COST RECOVERY"	-.425
	$ .282

*Approximate
**Based on NASA stated full cost recovery (NASA 24 Apr 85 Ltr) of $87 million (FY 82 $). Some CBO estimates give a higher cost.

SUBCOMMITTEE RECESS

Senator STEVENS. Thank you very much, gentlemen. We will look forward to Senator Garn's hearing. You can have the friendly turf over there.

[Whereupon, at 3:25 p.m., Thursday, May 9, the subcommittee was recessed, to reconvene at the call of the Chair.]

DEPARTMENT OF DEFENSE APPROPRIATIONS FOR FISCAL YEAR 1986

TUESDAY, MAY 21, 1985

U.S. Senate,
Subcommittee of the Committee on Appropriations,
Washington, DC.

The subcommittee met at 10 a.m., in room SD-192, Dirksen Senate Office Building, Hon. Ted Stevens (chairman) presiding.

Present: Senators Stevens, McClure, Andrews, D'Amato, Rudman, Proxmire, Johnston, and Sasser.

DEPARTMENT OF DEFENSE

Department of the Air Force

STATEMENT OF HON. THOMAS E. COOPER, ASSISTANT SECRETARTY OF THE AIR FORCE, RESEARCH, DEVELOPMENT, AND LOGISTICS

ACCOMPANIED BY:

- MAJ. GEN. HAROLD J.M. WILLIAMS, DIRECTOR OF OPERATIONAL REQUIREMENTS FOR RESEARCH, DEVELOPMENT AND ACQUISITION
- BRIG. GEN. GORDON E. FORNELL, SPECIAL ASSISTANT FOR ICBM MODERNIZATION FOR RESEARCH DEVELOPMENT AND ACQUISITION

STRATEGIC PROGRAMS

BUDGET REQUEST

Senator **Rudman** [presiding]. The hearing will be in order.

Chairman Stevens will be here probably within the next half hour. In the meantime, he has asked that we start the hearing and we will be pleased to do that.

We are here today to take testimony from the Air Force and Navy on their fiscal year 1986 strategic program budgets.

The fiscal year 1986 research and development request for the military services includes $8.6 billion for strategic programs. Of this amount, the Air Force has $5.7 billion and the Navy has $2.5 billion, mostly for the Trident II missile.

The budget request includes $18.5 billion for strategic procurement programs of the military services. The big-ticket items include $5.5 billion for the final 48 B-1B bombers, $3 billion for 48 MX Peacekeeper missiles and $582 million in advance procurement for the Trident II missile.

We will focus today on the programmatic aspects of the Air Force and Navy strategic programs and explore not only the 1986 budget, but the implications for long-term spending commitments in this period of defense budget restraint.

We plan to keep this hearing unclassified. To the extent to which we will request answers for classified matters, we will submit questions for the record.

INTRODUCTION OF WITNESSES

Our witnesses today are Dr. Thomas E. Cooper, Assistant Secretary of the Air Force for Research, Development and Logistics; Maj. Gen. Harold J.M. Williams, Director of Operational Requirements for Research, Development and Acquisition; and Brig. Gen. Gordon E. Fornell, Special Assistant for ICBM Modernization for Research, Development and Acquisition.

For the Navy, we have Commodore Kenneth C. Malley, Technical Director, Strategic Systems Programs.

We will put your complete written statements into the record. We would ask you to summarize them briefly in your opening remarks and then we will ask questions.

I yield to my friend from Wisconsin for any opening remarks.

Senator **Proxmire**. Thank you, Mr. Chairman. I have no opening statement.

Senator **Rudman**. I understand that my colleague from New York, Senator D'Amato, has an opening statement and some questions. I will yield to him.

PREPARED STATEMENT

Senator **D'Amato**. Thank you, Mr. Chairman.

I ask that my statement be included in the record in its entirety so that we can hear from the witnesses.

I will not be able to stay for the entire hearing. There are some questions I would like to submit for the record.

Senator **Rudman**. Without objection, the statement will appear in the record and all questions will be submitted for the record.

Senator **D'Amato**. Thank you.

[The statement follows:]

Prepared Statement of Alfonse D'Amato, U.S. Senator From New York

I appreciate this opportunity to join with you and the other members of this committee to review our strategic programs. Strategic programs are the foundation of our national security policy and are also the subject of intense public debate. Accordingly, they deserve our close attention.

Let me begin by stating some basic political facts. It is clearly the case that the Congress will not support a U.S. offensive strategic force build-up equal to the Soviet build-up. In fact, the President never requested an effort of that magnitude, desiring to reach deep arms reduction agreements with the Soviets.

The United States is faced with a problem. Despite the resumption of arms reduction talks in Geneva, there is not the slightest sign of slackening in Soviet strategic modernization efforts. Indeed, as was so clearly demonstrated during the debate on release of the fenced MX funds, deployment of the SS-24 is upon us—a year and a half before we deploy the MX!

We see on the horizon other major modern Soviet strategic offensive systems—the SS-25 small mobile ICBM, the Blackjack supersonic intercontinental bomber, the SS-NX-23 SLBM, the SS-NX-21 small cruise missile, the SSC-X-4 ground launched cruise missile, the SS-NX-24 large cruise missile, and its ground launched counterpart. And there are yet other new systems under development!

Our problem is this: Since the demobilization of the West's World War II armies, the defense of the United States—and of the West as a whole—has rested upon our strategic nuclear forces. While this analogy is imprecise and grossly oversimplifies the situation, you can think of our defenses as a house. Our strategic forces are the foundation of the house, our theater nuclear forces are the floor and the walls, our tactical nuclear forces are the ceiling, and our conventional forces are the roof. Without any of these parts, the house would not stand.

We have lived in this house, in comfort and safety, since the end of the second world war. Now, we are arguing about what we must do to maintain it so it will continue to protect us and our children from a hostile environment. This year, because of our budget deficit problems, we are deciding whether or not to put off crucial maintenance.

If we should put maintenance off too long, we will pay a price. Just as a homeowner would face tremendous expenses to keep his house from collapsing if he failed to deal with deterioration of the house's foundation, the citizens of the United States could be forced to pay a forbidding price to preserve their liberties and protect their freedom if we make the wrong decisions regarding our strategic forces.

Maintenance, in terms of our strategic forces, means the President's strategic modernization program. In light of the Soviet efforts I've listed, delaying or reducing the strategic modernization program—especially if such delays or reductions are based upon the hope of Soviet reciprocity—leads to very serious deterioration in the credibility of our strategic deterrent.

If we allow cracks to develop in the foundation of our house, all that our forefathers worked for and sacrificed for and all that we value for ourselves and our children could be swept away in the storm of war. In a crisis, deterrence could fail, the defenses of the West could collapse around us, and we could be confronted with the choice of surrender or triggering a nuclear holocaust.

Until the middle 1970's, the defense of the West rested upon U.S. strategic nuclear superiority. From this superiority flowed escalation dominance and extended deterrence.

Escalation dominance meant that, because we were superior at the highest, most destructive level of conflict—general nuclear war—we could chose whether and when to escalate the level of violence in any conflict which began below that level.

Extended deterrence meant that because we were confident in our strategic superiority, our threat to resort to theater and tactical nuclear forces to redress any impending conventional defeat was credible. Then, because our threat to employ theater and tactical nuclear forces was credible, our outnumbered an outgunned conventional forces were able to deter conventional attack. This equation held true only until the Soviet's strategic, theater, and tactical nuclear programs achieved parity with ours. We saw their efforts making steady progress. We relied upon our leaders who told us that the Soviets realized the folly of an arms race, were only seeking equal status and the respect they were due as a superpower, and would seriously negotiate a stable balance as soon as they reached parity. After all, they had worse domestic problems than we did and thus had an even greater need to be able to divert scarce resources away from a debilitating and ultimately futile military competition to help them improve conditions for their citizens.

That idea, which rested on some deomonstrably false premises, may prove to be the source of the greatest political and military mistake of this century—our decision to engage in unilateral strategic restraint. We now see that, regardless of their rhetoric, they are willing to command endless sacrifices from their people to serve their military goals. In fact, they do not view our military competition as futile—they view it as basic to their success as a revolutionary power.

They talk about this competition in terms of changes in the correlation of forces in the world. They have stated that the correlation has changed in their favor and that this change is irreversible. Upon this change in the correlation of forces they are trying to build a complex of coercive diplomacy, subversion, terrorism, and military action designed to isolate the United States from our allies and our trading partners.

Once we are weakened and isolated, Lenin's theory of imperialism—as modified to cast Western multi-national corporations in the place of the old colonial empires—predicts that we will return to the Marxist "main sequence" of historical development. Lacking the surplus economic product our multi-national corporations "expropriate" from "exploited" Third World nations, U.S. capitalists will no longer be able to afford the welfare state which keeps our proletariat satisfied with their position. Soviet theorists predict that our heterogeneous society will degenerate into class and race war. In the end, the revolution will occur here and the ultimate triumph of world communism will be secure.

Their ultimate goal is to achieve the fruits of war without having to fight a war—especially not a nuclear war. They believe time is on their side. They are convinced we lack the resolve necessary to defend ourselves. It is up to us to prove them wrong.

Let's have a look at how well we are doing. During the course of today's hearing, I will ask questions which will compare the strategic force structure we have today with the force structure we had in 1970. I will then ask that the witnesses compare both our 1970 force structure and our current force structure against the respective target bases they face. Finally, I will ask them to comment on the relative military effectiveness and credibility of the two levels of our forces and to project future developments based upon decisions we may make this year.

Thank you, Mr. Chairman.

INTRODUCTION OF ASSOCIATES

Senator **RUDMAN**. I wonder, Commodore Malley, if you might introduce the other gentlemen.

Commodore **MALLEY**. Yes, sir; to my left, Commodore Roger Bacon, OP 65. To my right, Commodore Ted Lewin, OP 21.

Senator **RUDMAN**. Dr. Cooper, why don't you proceed.

PENDING NOMINATIONS

Dr. **COOPER**. Thank you, Mr. Chairman.

I would like to start off with good news. As you know, General Russ has been my sidekick in these hearings for the last 3 years. The President has seen fit to nominate him, and I am pleased with it, to be the next commander of the Tactical Air Command. His nomination is now pending before the Senate. For that reason, he is not here today.

The President has also nominated Lt. Gen. Bernie Randolph, currently vice commander at the Air Force Systems Command, to take General Russ' place. Hopefully, that will be passed by the Senate shortly.

Senator **RUDMAN**. Probably will be the least controversial item we will take up in the next several weeks.

BOMBER MODERNIZATION PROGRAM

Dr. **COOPER**. If I could, I would like to take a few minutes to give you a status report on both our Bomber Modernization Program and our ICBM Modernization Program. From a technical point of view they are both success stories.

First, I would like to talk a bit about the bomber program. As you well know, the goal of the Bomber Modernization Program is to maintain the effectiveness of the P-52 force while we are developing and deploying an enhanced capability for the future.

Our plan involves converting most of our B-52G's and all of our H's to cruise missile carriers, producing 100 B-1B bombers and ultimately developing and deploying an advanced technology bomber to meet future needs and challenges.

We are also in the process of upgrading the avionics on the FB-111 fleet, and reengining the KC-135 tanker fleet.

Overall, the Bomber Modernization Program is doing extremely well. We have just recently, at the end of last year, completed equipping five B-52G squadrons with cruise missiles, and we are now in the process of equipping the remaining B-52H's with that same capability.

As far as the B-1 is concerned, it is moving a pace and, in fact, it is slightly ahead of schedule. We believe it is within the cost cap of $20.5 billion that was established by Congress and agreed to by the President for 100 B-1's.

We rolled out the first production B-1B in September of this past year and the first flight occurred last October. That was about 5 months ahead of schedule.

Some very interesting statistics. On June 29 of this year we will deliver the first operational B-1B to Dyess Air Force Base in Abilene, TX. The thing interesting about that date is that it was 30 years ago to the day that the first B-52 was delivered to SAC. That represents 30 years between deployment of new bombers.

A very brief word about the advanced technology bomber. As you know, that program is very highly classified, but I can tell the committee that it is moving smoothly forward. We are on the same schedule as we briefed the committee last year, and the program is fully funded to meet the early 1990's IOC that we briefed the committee on last year. That is a word about the Bomber Modernization Program.

ICBM PROGRAM

Turning to the ICBM Program, we are continuing to follow the recommendations of the President's Commission on Strategic Forces, better known as the Scowcroft Commission. Our program consists of developing and deploying 100 Peacekeepers in existing Minuteman III silos.

We are also in the process of developing and deploying a small ICBM in the 30,000-pound weight class, and we are undertaking a very vigorous ICBM basing technology program. Those are the three components of the ICBM Modernization Program.

As with the bomber program, we are experiencing very satisfactory technical progress with the program. We have had seven extremely successful shots of the Peacekeeper to date. The results have been truly outstanding. I think that I can tell you in open session that, relative to our accuracy goals, we are reaching accuracies that are twice as good as we had hoped to reach. So, it truly is an amazing success story.

Our production lines are up and churning, and our readiness is very high.

SMALL ICBM PROGRAM

As far as the Small ICBM Program is concerned, it is also progressing very smoothly. We now have an autonomous ICBM Program office in place. It has in excess of 200 people in it, and is headed by a brigadier general. It is solely responsible for the progress of the small ICBM.

To date we have awarded over 20 small ICBM contracts, and we have vigorous competition in all aspects of the program to include competition for an alternate guidance system. We have also had competition for the hard mobile launcher, the details of which I am sure we will develop further in questions.

In addition, we have promulsion stages competition on all three. So, we are stressing competition there.

In a nutshell, Mr. Chairman, we are off and running at a very fast pace on the small ICBM.

ICBM BASING TECHNOLOGY

Regarding the ICBM basing technology work, in addition to the hard mobile launcher, we are also looking at superhardened silos and soft road mobile concepts. We are very encouraged, by the way, by what we see on the superhardened silos. We think it will be possible to achieve hardness levels that are on the order of 25 times harder than our current generation silos.

That is the good news.

Downside of that is that right now it looks like these hardness levels will be very expensive to achieve. There are an awful lot of concrete and steel that goes into that, and the cost appears to be very high.

As with the Bomber Modernization Program, we are very pleased with the technical progress we have made to date on our ICBM Program. I think I can tell you that we are poised and ready to build the Nation a very effective and excellent ICBM capability.

With that brief overview, Mr. Chairman, I turn it over to my Navy colleagues to give their statement.

[The statement of Dr. Cooper follows:]

BEST

PREPARED STATEMENT OF HON. THOMAS E. COOPER
ASSISTANT SECRETARY OF THE AIR FORCE
RESEARCH, DEVELOPMENT AND LOGISTICS

MR CHAIRMAN AND MEMBERS OF THE COMMITTEE

Our strategic nuclear forces exist primarily to deter attack or aggression on the United States, our allies and other countries whose security is vital to our national interests. In recent years the Soviet Union has significantly increased its offensive capability and enhanced its ability to place our forces at risk. Soviet progress in strategic weaponry has been characterized by both massive force expansion and aggressive modernization.

The credibility of America's deterrent posture depends on Soviet perceptions that the United States has capable forces and the national resolve to use them, if necessary. The existing numerical imbalance of strategic forces coupled with the rapid pace of Soviet modernization diminish that credibility.

The Air Force Fiscal Year 1986 budget request continues the President's strategic modernization program. The objectives of that program are to: restore stability to the balance of strategic power, send a clear signal of our national resolve to strengthen our defenses and encourage the Soviet Union to rejoin the United States in meaningful negotiations for nuclear arms control. Firm adherence to the modernization plan and steady progress in the execution of our strategic programs are essential to the achievement of these objectives.

Our strategic offensive forces comprise a Triad of submarine launched ballistic missiles, land-based intercontinental ballistic missiles and long-range manned bombers. These three elements provide a mix of force characteristics which ensures maximum effectiveness and flexibility in responding to the Soviet threat. The Triad also complicates Soviet offensive and defensive planning because of difficulty in planning and executing a successful, simultaneous attack on all three elements.

The ICBM Leg

The U.S. ICBM leg has three central purposes. First, the ICBM force serves as a hedge against possible vulnerabilities in our submarine force (e.g., a Soviet breakthrough in anti-submarine warfare). Second, ICBMs introduce complexity and uncertainty into Soviet attack plans, because different types of attacks are required to defeat our ICBM, submarine and bomber forces. Third, ICBMs help deter Soviet threats of massive conventional or nuclear attack by virtue of their ability to respond promptly and controllably against hardened military targets.

The need for ICBM modernization stems from the requirement to respond to the pace and scope of Soviet ICBM development and deployment. The Soviet Union has deployed over 800 SS-17s, SS-18s, and SS-19s that have excellent accuracy and payloads as large or larger than Peacekeeper's. In addition, the current U.S. ICBM force is aging significantly. Titan II is being retired, and rehabilitation programs are required to keep Minuteman missiles operational. Meanwhile, Soviet SS-17, SS-18, and SS-19 missile systems (representing over half of the Soviet ICBM force) have been deployed since the last U.S. ICBM deployment.

To address the strategic imbalance, the President endorsed the ICBM Modernization Program in April 1983. The program was recommended by the Commission on Strategic Forces (Scowcroft Commission) and subsequently approved by the Congress. This program was built on the recognition that all ICBM tasks cannot be served by a single weapon system. Accordingly, the Commission recommended (1) promptly deploying 100 Peacekeeper missiles in existing Minuteman silos; (2) initiating engineering design of a single-warhead ICBM leading to deployment in the early 1990s; and (3) vigorously investigating follow-on basing technologies, including hardened vehicles and silos.

The main purpose of deploying the Peacekeeper missile system by December 1986 is to more effectively deter Soviet threats of massive conventional or nuclear attack against the U.S. and our allies. By virtue of its improved damage expectancy against hardened military targets, Peacekeeper accomplishes several strategic objectives.

First, the near-term Peacekeeper deployment begins to offset Soviet counterforce advantages created by Soviet ability to destroy hardened U.S. land-based targets. Peacekeeper has the range, yield, and accuracy to place at risk all Soviet target types-hardened and unhardened--with the most reliable and responsive leg of the Strategic Triad. Second, deploying Peacekeeper in existing Minuteman silos redresses the aging problem of the U.S. ICBM force. Third, Peacekeeper deployment encourages the Soviet Union to negotiate stabilizing arms control agreements by providing a tangible incentive to move toward less valuable deployments. Thus, the Peacekeeper deployment is the necessary step toward enhanced deterrence, increased strategic stability, and meaningful arms control negotiations.

Peacekeeper will be more accurate, carry more warheads, have greater range, and be more resistant to nuclear effects than other ICBM systems currently in the U.S. inventory. This enhanced capability will begin to offset the Soviet threat to present U.S. ICBM systems and help deter nuclear attacks on the United States and our allies by improving damage expectancy against the Soviet target base.

The first phase of the Peacekeeper flight test program has been completed successfully. The 41 reentry vehicles deployed on Peacekeeper flight test missiles to date have demonstrated excellent accuracy. Basing development and production activities are off to a good start. Deployment planning is well underway, and support activities are in progress. In short, the Peacekeeper Missile Program is on schedule and within cost. Deployment of the first 10 operational Peacekeeper missiles will be achieved by December 1986. Fiscal Year 1986 funding will be used to continue missile production, conduct testing and evaluation, construct support facilities and plan for deployment.

The Department of Defense and the Air Force are continuing development of the Small Intercontinental Ballistic Missile and hardened mobile transporter. Following the recommendations of the Schriever Commission, the Air Force appointed a general officer in July 1984 to direct the Small ICBM Program Office development and acquisition strategies for both missile and basing technologies.

The Schriever Commission also recommended the three phase program strategy that is currently being implemented by the Air Force. This program includes a competitive systems definition phase, a competitive pre-full scale development phase, and a full scale development phase. The system definition phase is nearing completion. This phase builds on Peacekeeper technology as well as assessing alternative technologies to ensure success in meeting the challenging goals mandated for the Small ICBM. The pre-full scale development phase began in late 1984 and will continue with competitive contracting for weapon systems integration, propulsion, and hard mobile launcher. The full-scale development phase for the basing mode or modes will begin in FY 1987. This program will lead to flight testing in 1988 with initial operational capabilities in 1992.

In order to meet the Small ICBM goals set forth by the President's Commission on Strategic Forces, the Office of the Secretary of Defense and the Air Force are directing top level management attention to the program. The Air Force has formed a General Officer Small Missile Advisory Group to recommend the best plan for development, production and deployment of the small missile system. Both a Small Missile Review Panel and a Small Missile Steering Group were established to ensure that potential small ICBM basing modes will be continued with FY 1985 and Fiscal Year 1986 funding.

Eighteen development contracts have been awarded during the Small ICBM concept definition phase. They encompass efforts in propulsion, Hard Mobile Launcher, guidance and control, command, control and communications and weapons system concept definition. Competition is currently underway for pre-full scale development contracts for assembly test and system support, booster and Hard Mobile Launcher systems. Efforts in the Small ICBM guidance research and development, the most challenging portion of the Small ICBM program, continue under initial development programs.

Hard Mobile Launcher hardness validation began in October 1984 and will continue in 1985. This testing is part of the joint Air Force and Defense Nuclear Agency program to define nuclear environment levels pertinent to hard mobile basing concepts.

Research and development is continuing in silo hardening and deep basing technologies. Past tests and development activities have yielded impressive results in both areas.

Testing of silo component materials began in 1983 and continued in 1984. All of these tests were successful. Implementing the recommendations of the Scowcroft Commission, the Air Force and Defense Nuclear Agency began a three-year program in 1983 to demonstrate and validate superhard silo technologies through large-scale tests. As part of this program, subsize tests and shock isolation system technology efforts in 1984 have been quite successful, providing confidence that predicted hardness levels will be achieved. Fiscal Year 1986 funding will be used to continue development and testing of superhardening technologies.

Significant progress was also made in deep basing technology development and subsystem engineering and demonstration. Technology development efforts are concentrated on the effects of nuclear weapons on deep underground facilities; evaluation of alternative power, heat sink and life support systems; through-the-earth communications; and improving tunneling technology. Subsystem engineering and demonstration efforts include missile egress, launch, power and heat sink systems. Fiscal Year 1986 funding will support continued testing to validate technology and further analysis efforts involving concept definition and system configuration.

The Bomber Leg

The second leg of the Triad is the manned bomber. Because it can be recalled, is reusable, and can accurately deliver both nuclear and conventional gravity weapons and cruise missiles, it is our most flexible leg. The bomber can be easily dispersed and is launched under positive control. The bomber can also provide a very effective show-of-force anywhere on the globe within a 24 hour period.

The mainstay of our strategic bomber force is the B-52. The B-52 fleet, currently consisting of 263 aircraft, is augmented by 61 FB-111As, and will soon be further augmented by deployment of the B-1B bomber. These bomber aircraft are capable of attacking targets across the entire spectrum of conflict. In addition to their traditional nuclear role, bomber aircraft have assumed an expanded conventional and maritime role. B-52 bombers have been modified to carry even larger conventional payloads as well as Harpoon missiles. B-52 bombers now perform sea lane defense, mine laying and sea surveillance missions.

Recognizing the need for a manned bomber and the limitations in our existing bomber forces, we have launched a phased modernization program for the air-breathing leg of the Triad. The B-52 is being modified for carriage of the Air Launched Cruise Missile (ALCM) assuming a role it will serve into the 1990s. Eventually the newer B-52H aircraft will be capable of carrying 20 cruise missiles, 12 externally and 8 internally. The B-1B will be deployed to eventually replace the B-52. By the end of the decade, the B-1B will be our primary penetrating bomber with the B-52 transitioning to cruise missile carrier and conventional/collateral roles. The Advanced Technology Bomber (ATB) will be deployed in the early 1990s to complement the B-1B and ensure that our bombers will be able to penetrate Soviet defenses.

Within the scope of the bomber modernization program, we are updating certain outdated systems on the B-52. This program includes a new offensive avionics system, improved electronic countermeasures, and update of the airborne radar and a new autopilot. These system improvements will ensure that the B-52 continues to operate effectively in the roles currently assigned to it consistent with its projected operational life.

Since 1981, we have made substantial progress toward the commitment to ensure that our military capabilities are strong enough to fulfill their vital purpose. To support this commitment, Air Force RDT&E and procurement programs are prudently structured to sustain the progress achieved. The Fiscal Year 1986 budget request continues a careful balance based on a realistic assessment of the threats. The success of this commitment depends substantially upon completion of the plan initiated with the FY 1982 budget.

Congressional approval and funding for our Fiscal Year 1986 budget request will allow us to continue the plan, restore our position of strength, demonstrate unified national resolve and protect and defend worldwide national interests.

Department of the Navy

STATEMENT OF COMMODORE KENNETH C. MALLEY, DIRECTOR, TECHNICAL DIVISION, DEFENSE SYSTEMS PROGRAM OFFICE

ACCOMPANIED BY:

COMMODORE ROGER F. BACON, DIRECTOR, STRATEGIC AND THEATER NUCLEAR WARFARE

COMMODORE THEODORE E. LEWIN, DIRECTOR, STRATEGIC SUBMARINE DIVISION

STRATEGIC SYSTEMS

Commodore **Malley**. Mr. Chairman, members of the committee, I am Commodore Kenneth Malley, Technical Director, Strategic Systems Programs. My office has the responsibility for the development, production, acquisition, and life-cycle support for the strategic weapon systems installed onboard the Navy's fleet ballistic missile submarines.

In addition, I have responsibility for the design and acquisition of those Trident submarines which are constructed with capability to carry the Trident II (D-5) configured Trident submarine base, Kings Bay, GA, required to support the D-5 configured Trident submarine.

Before giving you an overview of the Trident II (D-5) acquisition program, I would like to highlight my procurement request that is included in the Navy's fiscal year 1986 budget.

D-5 ACQUISITION

In the RDT&E,N appropriation a total of $2,165.6 million is requested for D-5 acquisition. In the Weapons Procurement, Navy [WPN] appropriation a total of $582 million is requested for D-5, $312.7 million in the Trident II (D-5) missile line item, and $269.3 million in the Trident II advance procurement line item.

The Trident II (D-5) missile line items funding in fiscal year 1986 provides for:

One. Production planning, activation, and initial equipment outfitting of buildings at the strategic weapons facility, Atlantic [SWFLANT] essential to establishing a Trident II missile processing capability.

Two. Procurement of MK-6 guidance system tooling and test equipment for contractors' facilities.

Three. Procurement of MK-4 and MK-5 reentry systems.

KING'S BAY SUBMARINE BASE REQUEST

The Other Procurement, Navy [OPN] appropriation request in fiscal year 1986 provides $215.3 million for acquisition of equipment that will be installed in facilities at the King's Bay Submarine Base and $24.3 million of other D-5 items.

Procurements in fiscal year 1986 for Kings Bay are based on lead time away schedules that support the building availability date and the equipment installation and checkout time period to provide for a complete, operational facility with trained personnel at IOC in December 1989 or ready-for-training date.

TRIDENT II (D-5)

In addition to the Kings Bay items, the OPN appropriation request in fiscal year 1986 also provides for $24.3 million of Trident II (D-5) for support of other shore sites and uses; that is, launcher tooling and handling equipment to support eastern test range operations, test instrumentatation equipment utilized for training range operations personnel, and launch tube closures.

The Trident II (D-5) strategic weapon system is currently in the second year of a 6-year full-scale engineering development and initial production program. The Trident II (D-5) strategic weapon system will provide a significant improvement in the capability of the submarine-launched ballistic missile force.

A follow-on to the Trident I (C-4) system, the Trident II (D-5) will have the capability to attack the entire Soviet target spectrum, including hard targets, through the employment of a larger missile with improved accuracy and payload characteristics including a new ballistic reentry body designated the MK-5.

The Trident II (D-5) will be deployed on new-construction SSBN 726 *Ohio* class submarines beginning with the ninth hull, the SSBN 734. This submarine is now under construction at Electric Boat Co. It will also be deployed on the first eight SSBN 726 class submarines, now configured to carry the Trident I (C-4) weapon system, after they are backfitted with the D-5 capability during their first overhauls.

Contracts have been awarded to all subsystems prime contractors for full-scale engineering development. The prime subsystem contractors and their respective subsystems are: Charles Stark Draper Laboratories, guidance subsystem; General Electric, fire control; Interstate Electronics Corp., test instrumentation, Lockheed Missiles & Space Co., missile (less guidance); Sperry Corp., navigation; Westinghouse Electric Corp., launcher.

As in all past fleet ballistic missile programs, there is no overall contractor with the responsibility of system integration. This integration function is performed by the Strategic Systems Program Office.

The Trident II (D-5) missile design does not present a radical departure from the Trident I (C-4) missile. The D-5, like the C-4, has three boost propulsion stages, but has a greater length and diameter which gives it the capability to carry a higher yield reentry body, the MK-5, or to carry more of the MK-4 reentry bodies which are now deployed on the Trident I (C-4) missile.

This payload flexibility will provide the Trident II weapon system with effectiveness across the full target spectrum.

MISSILE FLIGHT TESTS AT CANAVERAL

We are about 19 months away from our first missile flight test at Cape Canaveral. The missile flight test facility now under construction at Cape Canaveral has two functions:

Support the development flight test programs.

Support the continual demonstration of system reliability which is accomplished by demonstration and shakedown flights and operational test flights.

To support the Trident II (D-5) development flight test program which commences in fiscal year 1987, this facility is being modified with a new launch pad to handle the large Trident II missile. Delivery of missile system acceptance and checkout equipment to the test facility at the cape begins in 1986.

All major milestones in the development and production of the D-5 weapon system are on schedule and within cost projections.

SSBN 734 CONSTRUCTION

The first D-5 capable submarine, the SSBN 734, began construction in 1982 and is on schedule. All Government-furnished design information/equipment deliveries are meeting the shipbuilder's needs.

The ship is expected to complete construction in December 1988 to support performance evaluation missile launches in 1989 and to deploy with a full load of D-5 missiles in December 1989.

In support of the Trident II (D-5) initial operational capability of December 1989, the facilities to support the submarine, to train the crews for the submarines, and to assemble the Trident II missile are currently under construction, and on schedule, at the submarine base, Kings Bay.

SWFLANT KINGS BAY

The Strategic Weapons Facility, Atlantic [SWFLANT] at Kings Bay will provide facilities for the receipt and storage of missile components, the processing of those components, and the assembly and storage of Trident II missiles.

SWFLANT will also provide for the transfer of those missiles to the explosive handling wharf and the loading of those missiles onto the Trident submarine. Offloading of missiles and repair of returned missiles will also be within the SWF capability.

Production of Trident II missiles for the initial outload of the SSBM 734 will commence in early 1989.

TRFLANT KINGS BAY

The Trident Refit Facility, Atlantic [TRFLANT] at Kings Bay will provide industrial facilities for hull, mechanical, electrical, and electronic repair in direct support of the submarine.

Three fully equipped refit piers, a covered drydock, and a magnetic silencing facility will be provided to allow berthing of the submarine during various refit functions.

Additionally, a full repair parts supply facility will be part of the complex. The function of the refit facility is to perform corrective maintenance as well as preventive maintenance on the submarine, and schedule it in such a way as to allow the submarine to return to its patrol status in a very short time.

The Trident Training Facility, Atlantic [TTFLANT] at Kings Bay will provide, in a single building, all of the technical training requirements for the crews that man the submarine.

Through training devices of a highly sophisticated nature, crews will be initially trained and will also be provided refresher training in an efficient and timesaving manner during nonpatrol periods.

The training facility will be the largest building on the base, having more than 500,000 square feet of space under one roof.

In summary, I am pleased to report that the strategic weapon system, the submarine, and facility construction, as presently planned and budgeted are on schedule and within costs. All tests to date indicate that we should meet the required performance.

That concludes my statement. Thank you.

Senator **Rudman**. Thank you very much, Commodore Malley.

[The prepared statement of Commodore Malley follows:]

PREPARED STATEMENT OF COMMODORE KENNETH MALLEY (USN)

TECHNICAL DIRECTOR

STRATEGIC SYSTEMS PROGRAMS

MR. CHAIRMAN, MEMBERS OF THE COMMITTEE, I AM COMMODORE KENNETH MALLEY, TECHNICAL DIRECTOR, STRATEGIC SYSTEMS PROGRAMS. MY OFFICE HAS THE RESPONSIBILITY FOR THE DEVELOPMENT, PRODUCTION, ACQUISITION, AND LIFE-CYCLE SUPPORT FOR THE STRATEGIC WEAPON SYSTEMS INSTALLED ON BOARD THE NAVY'S FLEET BALLISTIC MISSILE SUBMARINES. IN ADDITION, I HAVE RESPONSIBILITY FOR THE DESIGN AND ACQUISITION OF THOSE TRIDENT SUBMARINES WHICH ARE CONSTRUCTED WITH CAPABILITY TO CARRY THE TRIDENT II (D5) MISSILE AND THE FACILITIES AT SUBMARINE BASE, KINGS BAY, GEORGIA REQUIRED TO SUPPORT THE D5 CONFIGURED TRIDENT SUBMARINE.

BEFORE GIVING YOU AN OVERVIEW OF THE TRIDENT II (D5) ACQUISITION PROGRAM I WOULD LIKE TO HIGHLIGHT MY PROCUREMENT REQUEST THAT IS INCLUDED IN THE NAVY'S FY 1986 BUDGET.

IN THE RDT&E,N APPROPRIATION A TOTAL OF $2165.6 MILLION IS REQUESTED FOR D5 ACQUISITION. IN THE WEAPONS PROCUREMENT, NAVY (WPN) APPROPRIATION A TOTAL OF $582.0 MILLION IS REQUESTED FOR D5, $312.7 MILLION IN THE TRIDENT II (D5) MISSILE LINE ITEM AND $269.3 MILLION IN THE TRIDENT II ADVANCE PROCUREMENT LINE ITEM.

THE TRIDENT II (D5) MISSILE LINE ITEM FUNDING IN FY 1986 PROVIDES FOR: 1) PRODUCTION PLANNING, ACTIVATION AND INITIAL EQUIPMENT OUTFITTING OF BUILDINGS AT THE STRATEGIC WEAPONS FACILITY, ATLANTIC (SWFLANT) ESSENTIAL TO ESTABLISHING A TRIDENT II MISSILE PROCESSING CAPABILITY; 2) PROCUREMENT OF MK6 GUIDANCE SYSTEM TOOLING AND TEST EQUIPMENT FOR CONTRACTORS' FACILITIES; AND 3) PROCUREMENT OF MK4 AND MK5 REENTRY SYSTEMS.

THE OTHER PROCUREMENT, NAVY (OPN) APPROPRIATION REQUEST IN FY 1986 PROVIDES $215.3 MILLION FOR ACQUISITION OF EQUIPMENT THAT WILL BE INSTALLED IN FACILITIES AT THE KINGS BAY SUBMARINE BASE AND $24.3 MILLION OF OTHER D5 ITEMS.

PROCUREMENTS IN FY 1986 FOR KINGS BAY ARE BASED ON LEAD-TIME AWAY SCHEDULES THAT SUPPORT THE BUILDING AVAILABILITY DATE AND THE EQUIPMENT INSTALLATION AND CHECKOUT TIME PERIOD TO PROVIDE FOR A COMPLETE, OPERATIONAL FACILITY WITH TRAINED PERSONNEL AT IOC OR READY-FOR-TRAINING DATE.

IN ADDITION TO THE KINGS BAY ITEMS, THE OPN APPROPRIATION REQUEST IN FY 1986 ALSO PROVIDES FOR $24.3 MILLION OF TRIDENT II (D5) FOR SUPPORT OF OTHER SHORE SITES AND USES, I.E., LAUNCHER TOOLING AND HANDLING EQUIPMENT TO SUPPORT EASTERN TEST RANGE OPERATIONS, TEST INSTRUMENTATION EQUIPMENT UTILIZED FOR TRAINING RANGE OPERATIONS PERSONNEL AND LAUNCH TUBE CLOSURES.

THE TRIDENT II (D5) STRATEGIC WEAPON SYSTEM IS CURRENTLY IN THE SECOND YEAR OF A SIX YEAR FULL SCALE ENGINEERING DEVELOPMENT AND INITIAL PRODUCTION PROGRAM. THE TRIDENT II (D5) STRATEGIC WEAPON SYSTEM WILL PROVIDE A SIGNIFICANT IMPROVEMENT IN THE CAPABILITY OF THE SUBMARINE LAUNCHED BALLISTIC MISSILE FORCE. A FOLLOW ON TO THE TRIDENT I (C4) SYSTEM, THE TRIDENT II (D5) WILL HAVE THE CAPABILITY TO ATTACK THE ENTIRE SOVIET TARGET SPECTRUM, INCLUDING HARD TARGETS, THROUGH THE EMPLOYMENT OF A LARGER MISSILE WITH IMPROVED ACCURACY AND PAYLOAD CHARACTERISTICS INCLUDING A NEW BALLISTIC REENTRY BODY DESIGNATED THE MK-5. THE TRIDENT II (D5) WILL BE DEPLOYED ON NEW CONSTRUCTION SSBN 726 (OHIO) CLASS SUBMARINES BEGINNING WITH THE NINTH HULL, THE SSBN 734. THIS SUBMARINE IS NOW UNDER

CONSTRUCTION AT ELECTRIC BOAT CO. IT WILL ALSO BE DEPLOYED ON THE FIRST EIGHT SSBN 726 CLASS SUBMARINES, NOW CONFIGURED TO CARRY THE TRIDENT I (C4) WEAPON SYSTEM, AFTER THEY ARE BACKFITTED WITH THE D5 CAPABILITY DURING THEIR FIRST OVERHAULS.

CONTRACTS HAVE BEEN AWARDED TO ALL SUBSYSTEM PRIME CONTRACTORS FOR FULL SCALE ENGINEERING DEVELOPMENT. THE PRIME SUBSYSTEM CONTRACTORS AND THEIR RESPECTIVE SUBSYSTEMS ARE: CHARLES STARK DRAPER LABORATORIES, GUIDANCE SUBSYSTEM; GENERAL ELECTRIC, FIRE CONTROL; INTERSTATE ELECTRONICS CORPORATION, TEST INSTRUMENTATION; LOCKHEED MISSILES AND SPACE CO., MISSILE (LESS GUIDANCE); SPERRY CORPORATION, NAVIGATION; WESTINGHOUSE ELECTRIC CORPORATION, LAUNCHER. AS IN ALL PAST FLEET BALLISTIC MISSILE PROGRAMS THERE IS NO OVERALL CONTRACTOR WITH THE RESPONSIBILITY OF SYSTEM INTEGRATION. THIS INTEGRATION FUNCTION IS PERFORMED BY THE STRATEGIC SYSTEMS PROGRAM OFFICE.

THE TRIDENT II (D5) MISSILE DESIGN DOES NOT PRESENT A RADICAL DEPARTURE FROM THE TRIDENT I (C4) MISSILE. THE D5, LIKE THE C4 HAS THREE BOOST PROPULSION STAGES BUT HAS A GREATER LENGTH AND DIAMETER WHICH GIVES IT THE CAPABILITY TO CARRY A HIGHER YIELD REENTRY BODY, THE MK5, OR TO CARRY MORE OF THE MK4 REENTRY BODIES WHICH ARE NOW DEPLOYED ON THE TRIDENT I (C4) MISSILE. THIS PAYLOAD FLEXIBILITY WILL PROVIDE THE TRIDENT II WEAPON SYSTEM WITH EFFECTIVENESS ACROSS THE FULL TARGET SPECTRUM.

WE ARE ABOUT NINETEEN MONTHS AWAY FROM OUR FIRST MISSILE FLIGHT TEST AT CAPE CANAVERAL. THE MISSILE FLIGHT TEST FACILITY NOW UNDER CONSTRUCTION AT CAPE CANAVERAL HAS TWO FUNCTIONS: SUPPORT THE DEVELOPMENT FLIGHT TEST PROGRAMS, AND SUPPORT THE CONTINUAL DEMONSTRATION OF SYSTEM RELIABILITY WHICH IS ACCOMPLISHED BY DEMONSTRATION AND SHAKEDOWN FLIGHTS AND OPERATIONAL TEST FLIGHTS. TO SUPPORT THE TRIDENT II (D5) DEVELOPMENT FLIGHT TEST PROGRAM, WHICH COMMENCES IN FY 1987, THIS FACILITY IS BEING MODIFIED WITH A NEW LAUNCH PAD TO HANDLE THE LARGE TRIDENT II MISSILE. DELIVERY OF MISSILE SYSTEM ACCEPTANCE AND CHECKOUT EQUIPMENT TO THE TEST FACILITY AT THE CAPE BEGINS IN 1986.

ALL MAJOR MILESTONES IN THE DEVELOPMENT AND PRODUCTION OF THE D5 WEAPON SYSTEM ARE ON SCHEDULE AND WITHIN COST PROJECTIONS.

THE FIRST D5 CAPABLE SUBMARINE, THE SSBN 734, BEGAN CONSTRUCTION IN 1982 AND IS ON SCHEDULE. ALL GOVERNMENT FURNISHED DESIGN INFORMATION/EQUIPMENT DELIVERIES ARE MEETING THE SHIPBUILDER'S NEEDS.

THE SHIP IS EXPECTED TO COMPLETE IN DECEMBER 1988 TO SUPPORT PERFORMANCE EVALUATION MISSILE LAUNCHES IN 1989 AND TO DEPLOY WITH A FULL LOAD OF D5 MISSILES IN DECEMBER 1989. IN SUPPORT OF THE TRIDENT II (D5) INITIAL OPERATIONAL CAPABILITY OF DECEMBER 1989, THE FACILITIES TO SUPPORT THE SUBMARINE, TO TRAIN THE CREWS FOR THE SUBMARINES, AND TO ASSEMBLE THE TRIDENT II MISSILES ARE CURRENTLY UNDER CONSTRUCTION, AND ON SCHEDULE, AT THE SUBMARINE BASE, KINGS BAY.

THE STRATEGIC WEAPONS FACILITY, ATLANTIC (SWFLANT) AT KINGS BAY WILL PROVIDE FACILITIES FOR THE RECEIPT AND STORAGE OF MISSILE COMPONENTS, THE PROCESSING OF THOSE COMPONENTS, AND THE ASSEMBLY AND STORAGE OF TRIDENT II MISSILES. SWFLANT WILL ALSO PROVIDE FOR THE TRANSFER OF THOSE MISSILES TO THE EXPLOSIVE HANDLING WHARF AND THE LOADING OF THOSE MISSILES ONTO THE TRIDENT SUBMARINE. OFFLOADING OF MISSILES AND REPAIR OF RETURNED MISSILES WILL ALSO BE WITHIN THE SWF CAPABILITY. PRODUCTION OF TRIDENT II MISSILES FOR THE INITIAL OUTLOAD OF THE SSBN 734 WILL COMMENCE IN EARLY 1989.

THE TRIDENT REFIT FACILITY, ATLANTIC (TRFLANT) AT KINGS BAY WILL PROVIDE INDUSTRIAL FACILITIES FOR HULL, MECHANICAL, ELECTRICAL, AND ELECTRONIC

REPAIR IN DIRECT SUPPORT OF THE SUBMARINE. THREE FULLY EQUIPPED REFIT PIERS, A COVERED DRYDOCK, AND A MAGNETIC SILENCING FACILITY WILL BE PROVIDED TO ALLOW BERTHING OF THE SUBMARINE DURING VARIOUS REFIT FUNCTIONS.

ADDITIONALLY, A FULL REPAIR PARTS SUPPLY FACILITY WILL BE PART OF THE COMPLEX. THE FUNCTION OF THE REFIT FACILITY IS TO PERFORM CORRECTIVE MAINTENANCE AS WELL AS PREVENTIVE MAINTENANCE ON THE SUBMARINE, AND SCHEDULE IT IN SUCH A WAY AS TO ALLOW THE SUBMARINE TO RETURN TO ITS PATROL STATUS IN A VERY SHORT TIME.

THE TRIDENT TRAINING FACILITY, ATLANTIC (TTFLANT) AT KINGS BAY WILL PROVIDE, IN A SINGLE BUILDING, ALL OF THE TECHNICAL TRAINING REQUIREMENTS FOR THE CREWS THAT MAN THE SUBMARINE. THROUGH TRAINING DEVICES OF A HIGHLY SOPHISTICATED NATURE, CREWS WILL BE INITIALLY TRAINED AND WILL ALSO BE PROVIDED REFRESHER TRAINING IN AN EFFICIENT AND TIME-SAVING MANNER DURING NON-PATROL PERIODS. THE TRAINING FACILITY WILL BE THE LARGEST BUILDING ON THE BASE, HAVING MORE THAN FIVE HUNDRED THOUSAND SQUARE FEET OF SPACE UNDER ROOF.

IN SUMMARY, I AM PLEASED TO REPORT THAT THE STRATEGIC WEAPON SYSTEM, THE SUBMARINE, AND FACILITY CONSTRUCTION, AS PRESENTLY PLANNED AND BUDGETED ARE ON SCHEDULE AND WITHIN COSTS. ALL TESTS TO DATE INDICATE THAT WE SHOULD MEET THE REQUIRED PERFORMANCE.

THANK YOU.

GENERAL QUESTIONING

AMENDMENT ON ZERO FUNDING FOR MX

Senator **RUDMAN**. Dr. Cooper, by the merest of coincidences the pending business on the floor of the Senate at this moment is an amendment offered by Senator Hart of Colorado for essentially zero funding for MX, and following that there will be an amendment offered by Senator Nunn which will call for some reduction.

My question really directs itself to the question of what is going to happen if in fact, and I think there is a high degree of possibility that it is going to happen, that the eventual MX deployment is capped at 50?

My question then is: How many missiles will be required for operational testing requirements, but even more important, in your view, are 50 MX missiles sufficient in number to really make what is a credible deterrent, the purpose for which they were intended? Those are two questions.

Dr. **COOPER**. Let me take the first part of your question first.

Senator Rudman, in terms of the need for operational missiles, we plan to have seven test flights a year. So, whether you deploy 1 operational Peacekeeper missile, 50 or 100, the number of test flights is independent. We see our need for test missiles to be 108 over the life of the program.

In addition, we need 15 more for our surveillance and aging program. So, that is a total of 123 in addition to the missiles that we deploy. That is consistent with the number of tests that we have today with Minuteman, as an example.

Now, as far as the second part of your question, do I think 50 is enough?

The answer to that is absolutely not. The President's program is for 100; 50 less missiles will represent 500 less warheads. We think there is a valid military need to deploy 1,000 Peacekeeper type warheads to strengthen our deterrence. That is the President's program, and we are firmly behind that.

Senator **Rudman**. Now, if in fact, that is what happens, then you are going to have to supplant those 500, because the balance of the triad requires those thousand warheads, with 500 single warhead Midgetman missiles; is that not correct?

Dr. **Cooper**. I haven't thought through this, Senator, but if we only deployed 50 Peacekeepers, that means we would not deactivate 50 Minuteman missiles that we are currently planning on deactivating. That represents 150 warheads. I guess you would be looking at 350 additional small ICBM type warheads.

HARDENED MOBILE LAUNCHES

Senator **Rudman**. In fact, one of the prime basing modes for the small missile would be in a superhardened site. That is one of the serious options, is it not?

Dr. **Cooper**. Our preferred option at the present is the hardened mobile launchers; we are trying to stress mobility. We are also looking at superhardened silos.

As you recall, the Scowcroft Commission said the ultimate deployment might be a combination of mobile launchers and superhardened silos.

Senator **Rudman**. The question of mobility gets into another subject. I am assuming you will not do that only from a point of view of verification in arms control. I am assuming there will be a treaty and one of the things that a treaty will do is try to maintain verifiability. That is just one person's opinion.

But going to that hypothetical and taking your original answer to my third question that you would have 350 required, if that is what was assumed to be the replacement number, keeping the Minutemen———

Dr. **Cooper**. I want to be clear that I was clarifying your point on 500.

Senator **Rudman**. I understand.

Dr. **Cooper**. I am not prepared to say that is how we would address a 50 Peacekeeper shortfall.

Senator **Rudman**. It is hypothetical, but it is probably not illogical in terms of the time it takes to do all these things. If Congress did not fund a certain number of these, obviously to maintain deterrence I expect we would not start taking down Minutemen. Even though they achieve less than we want, they still essentially work, until we have the newer version.

Let us assume that we deploy 300 or 350 missiles and that we go to hardened sites, you started off the hearing by saying we have some good news and bad news. I want to talk about the bad news.

It would cost nearly as much from what I know to superharden one Midetman site as it would to harden an MX site.

Is that right or wrong?

Dr. **Cooper**. It will be in the same ball park.

Senator RUDMAN. Same magnitude. It will be a smaller missile, but it needs the same kind of overhead protection. So, what we may be doing, putting the whole strategic considerations aside and all the questions of vulerability, if we go in that direction, we may end up with a missile that is very expensive. But even more importantly, it would be in order to base it properly, enormously expensive, to build the 350 missles plus 350 superhardened sites.

So, in terms of saving money, there is no money to be saved?

MIRV'D MISSILES

Dr. COOPER. In terms of saving money, Senator—and the Scowcroft Commission did not make their recommendation based on cost effectiveness—but in terms of saving money, the cheapest way to go is with the MIRV'd missile. That is one of the reasons we introduced MIRV'ing way back when, because in a MIRV'd system you have a relatively small number of people taking care of a large number of warheads.

When you go to a single warhead system, you are going to have a relatively large number of people taking care of a single warhead. So, obviously, there is a down side to that in terms of economics and cost.

You are right, the small missiles in hardened mobile launchers or superhardened silos is an expensive proposition.

Senator RUDMAN. I want to have this in the record this morning, not for any particular purpose of what is going on today in the Senate, but taking the long way, if, in fact, what the experts said was impossible or not likely 5 years ago, and that is the development of superhardened sites that really work, then we are probably going to make a terrible error.

And looking 3, 4, 5 years down the road in terms of the amount of money we are going to have to spend to get the same land-based deterrence with mobile launchers, it will be terribly expensive.

Would you agree?

Dr. COOPER. I would agree that a single warhead missile deployed on either a hardened mobile launcher or in a superhardened silo is going to be a more expensive warhead than a MIRV'd system; yes, sir.

Senator RUDMAN. Not only expensive, but a great deal more expensive?

COST ESTIMATES ON SUPER HARDENED SILOS

Dr. COOPER. Let me give you some ball park figures. We have made these public.

Our best estimate to deploy 50 superhardened silos is on the order of $9 billion in 1982 dollars.

Now, really, probably it is better to say $10 billion. We are talking about orders of magnitude here. We are not talking about $1 billion or $100 billion. It looks to us right now that we are talking on the order of $10 billion.

I would caution you that we are still somewhat early in the development program and there may be more cost-effective techniques down the road that we will find to build these silos. I think it is too early to make a determination on whether superhardened silos are cost effective.

We need to let that research and development play out for a couple more years. We have not made a commitment to deploy superhardened silos. We are, however, very encouraged technologically by what we see, because we have found things over the last year that we, heretofore, did not think were possible in terms of hardness.

However, I don't think we should throw the baby out with the bath water at this point. We need to continue with the development program for another year or so and look very hard at the economics of it.

Senator **Rudman**. The fact is, if I am not mistaken, that the House has essentially taken a great deal of that money or all of the money out for the hardening, has it not?

Dr. **Cooper**. I believe the House has zeroed our efforts on superhardened silos. I would adamantly oppose that, Senator. I think that is premature.

ARGUMENTS AGAINST MX

Senator **Rudman**. I would oppose it also because it seems to me that the arguments against the MX, the ones that are listened to and ones that make some sense are to place this missile in an old hole.

We have heard it so many times it is like a chant around here.

Dr. **Cooper** Some people are beginning to believe it. I violently disagree with that.

Senator **Rudman**. Whether true or not, if the superhardend research works, it is not true, that the MX could in no way be called a first-strike weapon. I never believed it was anyway.

You could never say that if it could be proved it could survive. You will not know that for a couple of years. We are making a serious decision that in the long run could potentially cost us enormously more money.

I happen to believe, until we have the facts, we just don't know whether or not the superhardened sites will work. If they will work, 100 MX's will be a bargain.

Let me just ask one other question——

Dr. **Cooper**. Could I make two points, Senator? I agree with you. First, I believe that in the near term we need to go forward with the MX deployment of 100 Peacekeepers. Second, I believe in the near term we need to keep all of our options open for some additional period of time.

I really think it would be premature at this point to foreclose any of those options until we get better data.

Senator **Rudman**. We might want some of that information for committee members who are undecided on the issue of the superhardening. We might want a classified briefing on that. I will discuss that with the chairman.

NETWORK

The last question I really have, is for Dr. Cooper. I am not trying to ignore the Navy, but I don't have any questions for you in this round.

I will not get into classified matters, but we had a closed hearing concerning the C-cube network and the whole question of communicating with the sea-based leg of the triad. I am sure you are familiar with that whole issue. It had to do with the E-6 issue.

There were some issues raised there that were of concern to a number of us. Let me ask you this. How good is our command, control, and communications with our land-based leg of the triad, in regards to all of the things that might well happen if we were to sustain a first strike?

Dr. **Cooper**. Of course, for me to get into that in a lot of detail would go to a higher level of classification, but let me say in open session that our C^3 system today is adequate, I believe, to meet the threat that we have today.

We certainly need to make improvements in it in the future. We are doing that in a number of areas to include, for example, the MILSTAR satellite system and the ground wave emergency network system, among other things.

As you may recall, in the President's five-point strategic modernization program, which he put into place 3 years ago, the No. 1 priority was to strengthen and improve the command, control, and communications network. We are dedicated to doing that. That is the central nervous system of all three legs of the triad.

If that is weak, then it necessarily weakens the three legs of the triad. I think it is adequate today, but we believe we need to improve it for the future.

Senator **Rudman**. Thank you.

Senator Proxmire.

HARD TARGET CAPABILITY FOR D-5

Senator **Proxmire**. Commodore Malley, when the D-5 is deployed in December 1989 the Navy will have significant hard target capability, one that will grow substantially as more D-5's go to sea.

Do you agree?

Commodore **Malley**. Yes, sir.

Senator **Proxmire**. Doesn't that lessen the need we have for the land-based hard target missile, MX?

Commodore **Malley**. I can't answer that question, Senator.

Senator **Proxmire**. It seems awfully logical to me.

Why wouldn't that follow?

Commodore **Malley**. I am only responding——

Senator **Proxmire**. How many do we need in hard target capability?

Commodore **Malley**. I am responding that the hard target capability is not within my purview. I am strictly the program manager of the Trident.

Senator **Proxmire**. Will you pull the microphone a little closer.

Commodore **Malley**. Yes, sir. What I was saying is that responding to what we need for hard-target-kill capability is not something

I get involved in on a day-to-day basis. I really can't answer that question.

Commodore Bacon might be able to answer that one.

Commodore BACON. The modernization program, modified somewhat following the Scowcroft Commission's recommendations, stems from the President's direction. It extends across all three legs of the triad.

Through both the Peacekeeper Program and the Trident II (D-5) Program, our effort has been to increase our capability against the full spectrum of targets in the Soviet Union—capability which we are lacking now. We need to improve across the full triad.

SENATE SUPPORT OF D-5

Senator PROXMIRE. As far as I can tell, there is overwhelming universal approval of the D-5 in the Senate. I don't know anybody in the Senate against it. I am an enthusiastic supporter of it. I think we ought to proceed with it vigorously. That is one of the reasons why this Senator is opposed to the MX.

I see that Secretary Cooper is nodding his head. I am sure you have an answer, Mr. Secretary. Why don't you go ahead.

Dr. COOPER. I would like to comment, if I might.

Senator PROXMIRE. I wish you would.

Dr. COOPER. I will start off by saying that I think a three-legged stool is inherently more stable than a two-legged stool.

Let me preface my comment by saying I am supporting of the D-5 missile as I am of the Peacekeeper missile.

Senator PROXMIRE. Let me interrupt to say there is a difference that you might want to address your answer to. That is the D-5 tends to be infinitely less vulnerable.

We are told by the Secretary of the Navy that our submarines are increasingly less vulnerable as time goes on because technology is improving constantly and the MX seems to be vulnerable.

LOW-LEVEL VULNERABILITY OF D-5

Now you say you can superharden targets. We will have to wait and see if that is going to happen. We know that the D-5 has a very low level of vulnerability.

Dr. COOPER. I believe that, too, Senator. I believe that will remain so in the future, at least in the foreseeable future.

I think one of the reasons for that is that, with the three legs of the triad, it does not give the Soviet Union the luxury of dedicating increased resources to the antisubmarine warfare problem.

The point I wanted to make on the three-legged stool is that when we talk about vulnerability, you have to talk about the vulnerability of the triad. I would only suggest that I do not think the triad is vulnerable.

Senator PROXMIRE. I agree with you wholeheartedly on the notion of the triad.

It seems to me you don't have to have the triad to be able to do everything. We certainly need land-based missiles. It seems to me a mobile land-based missile, single warhead, is less vulnerable from what we know now for sure.

Dr. **Cooper**. Sir, we have a valid military need today to address the asymmetry that exists between the Soviet capability in their ICBM force and our capability in our ICBM force.

The Soviets today threaten a class of targets in the United States, a threat that we do not reciprocate in the Soviet Union. There is a valid military requirement for a prompt response, accurate ICBM.

Senator **Proxmire**. Can it attack a full spectrum of targets?

You asserted that it can do that.

Dr. **Cooper**. I think to get into a precise discussion of what the D-5 can do and cannot do and what the Peacekeeper can do and cannot do, we would have to go into a high level of classification.

I think you got into that discussion with General Davis when he was here.

B-1B BOMBER PRODUCTION

Senator **Proxmire**. Does the Department of Defense have any contingency plans for continuing the B-1B bomber production beyond the currently planned level of 100?

Dr. **Cooper**. Absolutely not. Our program is for 100 B-1 bombers and 100 only, to be followed by the advanced technology bomber.

ROCKWELL ARGUMENTS FOR INCREASED PRODUCTION

Senator **Proxmire**. Rockwell International makes a number of points about the B-1B, all of which they say argues for going ahead with the production beyond the 100 aircraft.

Would you address each of these B-1B arguments from the standpoint of continuing production beyond 100?

First, they say the B-1B will be able to incorporate many Stealth characteristics and thus lessen our need for the advanced technology bomber.

What is your response?

Dr. **Cooper**. I agree there are certain things that can be done to the B-1 to reduce its radar cross section, but not nearly to the level of the advanced technology bomber.

B-1B/ATB COST COMPARISON

Senator **Proxmire**. Second, they argue that the cost of the last B-1B will be one-half to one-third the cost of the first ATB aircraft.

Recognizing, of course, the learning curves, what is your response to that issue?

Dr. **Cooper**. That is true. Any time you move from an old system to a new system, that is a situation you face.

I think a more appropriate measure would be the average cost of the ATB versus the average cost of the B-1.

SUNK COST ARGUMENT

Senator **Proxmire**. Third, they argue the sunk cost argument, that it would be a waste of manpower and research and development costs to stop B-1B production at 100 when we have such an experienced team working on it when the Government has spent so much funds already on the program.

What is your answer to that argument?

Dr. Cooper. I think it is unfortunate that that is true; we are going to lose skilled manpower. I think in terms of the technology we are gaining in the ATB, that is the price we have to pay. We are dedicated to the advanced technology bomber. That is our No. 1 priority at this point after we buy 100 B-1's.

Senator Proxmire. That is my feeling, too. I just wanted to get this on the record.

I am also for the Stealth. I don't think many people in Congress or out of Congress understand the classic so-called box theory, which protects the triad from attack. That is, our adversary, for reasons of geography and timing, cannot launch an attack simultaneously with its ICBM's, SLBM's, and bombers with a simultaneous arrival on U.S. targets.

A simultaneous launch results in greatly different arrival times. A phased launch results in a simultaneous arrival time, but also alerts the United States to the impending attack and allows us to get our bombers in the air and SLBM's and ICBM's on alert.

Is that not the complicating factor for the Russians and does not that make a successful first strike almost impossible?

Dr. Cooper. That is the beauty of the triad, Senator. You have stated my case very well.

The diversification and the synergistic effect of the three legs is what complicates, confounds, and confuses the Soviets.

Senator Proxmire. I agree with that, but I don't think the MX is an essential part of it.

Mr. Cooper, if the United States and the U.S.S.R. do not abide by the limitations of SALT II, if both decide to disregard the limitations, is not the Soviet Union in a position to add many more launchers and many more warheads to their inventory in a short time than the United States could in the same circumstances?

Dr. Cooper. I would say they are certainly in a position to add more. Both of us are in a position to add more if we don't abide by the limits of SALT II.

Senator Proxmire. Why is it not pretty obvious they would be able to add more inasmuch as they have such a big throw weight advantage and a larger number of ICBM's and lesser MIRV'd than we are?

SS-18 WARHEAD CAPABILITY

Dr. Cooper. If you look at their SS-18—I didn't catch the gist of your question—they are certainly able to put more warheads on the SS-18. As you know, we are limited to 10 today, as are both sides.

The SS-1B certainly has the capability to take more warheads than the limit of 10.

Senator Proxmire. If we let the SALT II go, we decide to walk away from it, of course, they will, too, it seems to me the advantage will go to them rather than to us.

Dr. Cooper. I am not an expert witness in that. Your point is well taken as far as the SS-18 is concerned. That is an arms control issue, and I am not the expert witness on arms control.

STRATEGIC DEFENSE INITIATIVE

Senator **Proxmire**. Let me see if there is any economy obvious in the SDI.

If the United States and the Soviet Union had a star wars, SDI, system in place, what strategic systems could we do without? Could we do without bombers?

Dr. **Cooper**. Again, that gets into the arms control arena, Senator Proxmire. I think what the President has said is if we have an SDI system and if the Soviets have an SDI system, I think it gives both of us more of an incentive to sit down and look at reducing offensive weapons.

That is the leverage that ultimately can be gleaned out of having a SDI.

As far as what we would draw down, specifically, the SDI today is aimed at ICBM's. If we had an impregnable SDI, it might be a great incentive for the Soviets to sit down and talk about reducing the levels of ICBM's and SLBM's.

Senator **Proxmire**. Will SDI be able to handle the bombers and the ICBM's?

Dr. **Cooper**. It could handle sea-launched ballistic missiles as well as intercontinental ballistic missiles. SDI today as structured does not address the bomber problem.

Senator **Proxmire**. Thank you very much, Mr. Chairman.

I will try to get back. If not, I hope my questions will go into the record.

Senator **Rudman**. They will go in the record. Thank you, Senator Proxmire.

Senator Sasser.

ICBM SILO HARDENING

Senator **Sasser**. Secretary Cooper, it has been reported that you knew studies by the Air Force indicate that our intercontinental ballistic missile silos are harder than we previously assumed.

Now what can you tell us in an open session about that particular study and can you tell us in an open session whether or not it is the view of the Air Force that our existing silos can withstand a Soviet attack?

Senator **Rudman**. Secretary Cooper, if you want General Fornell to come to the stand, you are free to do that.

Dr. **Cooper**. I won't hesitate to do that.

I wanted to check to see if we could talk about this in open session.

I don't think we should get into great detail on that. I will say we do periodically update our analysis of the silos. We have not done anything in terms of physically changing the silos to change those hardness levels, but in terms of looking at geology and those sorts of things, we do estimate that today those hardness levels are moderately higher than we estimated a couple years ago.

That is just a reestimation of the hardness levels. It is not that we have gone into and reconstructed the silos in any way.

It will have some effect on our estimates in terms of damage probability, but certainly not to the degree that we are talking about if we superharden the silos.

ACCURACY OF SOVIET SS-18 MISSILE

Senator **Sasser**. Mr. Secretary, it has been reported that General Davis, the SAC Commander, stated in an open session to a House committee, General Davis stated that the accuracy of the Soviet SS-18 has been reassessed and that the SS-18 is not as accurate as we previously thought.

Are SS-18's accurate enough to destroy existing silos, in your judgment, or can you answer that question here in open session?

Dr. **Cooper**. I think I had better defer that for a classified session, Senator.

MOBILE ICBM'S

Senator **Sasser**. Let us move on to something else that I think probably you can answer.

The Scowcroft Commission has urged the development of a small ICBM, so-called mobile missile. The Scowcroft Commission has stated that in their judgment mobile ICBM's will lead to improved strategic development.

Now, that makes sense to me, I suppose. Recently, though, the administration has characterized a Soviet mobile missile, the SS-X-24, as being a first strike weapon and as a destabilizing weapon.

Now, does the Air Force believe that mobile ICBM's lead to stability or not?

Dr. **Cooper**. In an arms control environment, yes, I believe they can lead to stability.

Again, going back to the Scowcroft Commission, they recommended 100 Peacekeepers to be followed by a small ICBM and a vigorous approach to arms control. I think those three taken together can lead to a stable environment. Unconstrained, you can get yourself into a situation where you are unstable.

Senator **Sasser**. In other words, can you explain the fact that the Reagan administration is now characterizing the mobile Soviet missile as being a first strike weapon as destabilizing because they are not developed in an arms control scenario?

Dr. **Cooper**. Left unchecked and with proper accuracy and by your characterization of instability, it could be destabilizing.

BASING DECISIONS ON U.S. MISSILES

Senator **Sasser**. Now, the Air Force is studying alternatives for small ICBM basing. Either the basing mode is going to be mobile or it will be placed in hardened silos.

When will the basing decision be made on Midgetman?

Dr. **Cooper**. We have made our preliminary basing decision, Senator. Our primary mode right now is the mobile mode. We have two contractors, Martin-Marietta and Boeing going head to head to develop a hardened mobile launcher for us.

Our preferred basing mode at this point is the mobile mode.

We are also looking, as I mentioned earlier, at superhardened silos.

SUPERHARDENED SILO PROGRAM

Senator SASSER. You haven't abandoned the idea of superhardened silos?

Dr. COOPER. No, we have not. That is an alternative we are looking at right now. Our base program is 30,000-pound ICBM's deployed on a hardened mobile launcher.

Senator SASSER. At this point in the study by the Air Force, is it projected that a mobile ICBM or a silo-based ICBM will be more secure from a Soviet threat?

Dr. COOPER. In fact, Senator, it could be in the long term a combination of those two.

Senator SASSER. A mix of them?

Dr. COOPER. A mix of them might be the way to go. We have not progressed far enough with our superhardening efforts to make a commitment to superharden silos. That is why we baselined the hardened mobile launcher.

I don't think it is an either/or proposition. It may be a combination of the two in the long term.

HARDENED SILO TECHNIQUES

Senator SASSER. In an earlier hearing I questioned witnesses about recent advances in hardened silo techniques. I do have an interest in that. I serve on the Military Construction Subcommittee of the full Appropriations Committee which deals with the construction aspects.

Now it appears that we will be able to provide silos which are perhaps 25 times harder than Minuteman silos today.

Is that a correct assessment?

Dr. COOPER. That is our best estimate right now. We are very encouraged. We have seen hardness levels that approach 25 times the levels that we have today.

COST OF SUPERHARDENED SILOS

Senator SASSER. These superhardened silos will be very expensive. It is estimated that hardened MX silos in this fashion would cost an additional $30 billion.

Is that a correct statement?

Dr. COOPER. I do not believe so. I mentioned earlier that our current estimates are on the order of $10 billion for 50 Peacekeeper type silos. That is an order of magnitude estimate.

As I pointed out, that is to be differentiated from $1 billion or $100 billion. For fifty Peacekeeper silos, our best estimate is $9 to $10 billion; 100 superhardened Peacekeeper silos will go on the order of $15 billion.

Senator SASSER. So. 100 superhardened MX silos on the order of $15 billion?

Dr. COOPER. $15 billion in 1982 dollars.

Senator SASSER. How long would it take to superharden 100 MX silos?

Dr. COOPER. When could we have 100 in place?

Senator SASSER. How long would it take to superharden 100 MX silos?

Dr. **Cooper**. I am not sure I can answer that right now. The earliest that we could get started would be the latter part of this decade.

Senator **Sasser**. To get started the last part of this decade?

Dr. **Cooper**. I mean to deploy Peackeeper in superhardened silos would take till the 1989-90 timeframe if we made a commitment today, which we have not. That would be the earliest. We are not talking about upgrades to the current silos. We are talking about entirely new silos.

EFFECTIVENESS OF FIXED AND MOBILE LAUNCHERS

Senator **Sasser**. Now fixed silos, it appears to me, make it easier for the Soviets to target ICBM's. I am sure we can agree on that. But, in your judgment, which would be easier for the Soviets to overcome, our missiles in superhardened silos or our missiles on mobile launchers?

Dr. **Cooper**. I think mobility in the long term poses more of a problem for the Soviets than superhardening.

Senator **Sasser**. So do I.

Dr. **Cooper**. Both would pose a problem to them. But at some point if their accuracies are reduced to a certain level, accuracy will overcome superhardening, particularly if you can put the silo in the crater created by the explosion.

They are not able to do that today, Senator, and I don't project any time soon they will be able to, but it will be a challenge for them to try.

D-5 MISSILE

Senator **Sasser**. Mr. Secretary, why can't we put D-5 missiles in superhardened silos as well as putting them on submarines?

Dr. **Cooper**. You could put D-5 in the superhardened silos. You may recall that the previous administration, before they made a decision to start missile development of the Peacekeeper, looked at the question of whether or not we should go with a common missile.

A couple points need to be made. I believe the D-5 is an 83-inch diameter missile, which is constrained by the submarine tube. The Peacekeeper is 92 inches.

One of the reasons that the decision was made to go to the larger missile is the thought that this will probably be the last ICBM that we will deploy for a very long time, and it has a larger payload capability than does the D-5.

Another concern is that if you run into technical problems with a common missile, you threaten two legs of the Triad at the same time. For instance, if you had a catastrophic failure with the propellant, you would have two legs of your triad down at the same time. Also, when they looked at the cost, the cost saving by going with a common missile was judged to be very minimal.

For those various reasons, the decision was made to go forward with two separate missiles.

Senator **Sasser**. When will the D-5 be operational?

Commodore **Malley**. December 1989.

Dr. **Cooper**. And we will be operational with the Peacekeeper in 1986.

Senator **Sasser**. How big a factor was the fact that the Air Force wanted their MX missile and didn't want to use the Navy's D-5?

Dr. **Cooper**. Senator, that is always a factor. I wouldn't tell you otherwise. It wasn't the Air Force and Navy that made the decision. It was the Office of the Secretary of Defense. Bill Perry, himself, was involved in that.

Senator **Sasser**. One final question.

B-1 BOMB LOADER

How are we coming on our B-1 bomb loader?

Dr. **Cooper**. I am glad you asked that. I have been here four times now, and you have asked me that each time. Tomorrow I have a hearing before the House Armed Services Committee on a reprogramming to support that program. That will be D-day, decision day.

Senator **Sasser**. We are going to keep the heat on that.

Dr. **Cooper**. I hope you do. I think there is a principle involved here that goes beyond the munitions lift trailer. The principle is competition. We had a fair and open competition. Everyone was invited to bid. They did. We had 60 people who looked at the source selection information.

The weapons loader that we chose came in at a total cost of $27 million. Its nearest rival, which is the one that is in question, is at $36 million.

As source selection authority, I have no other alternative but to go with the guy who was low cost, meets all the logistics requirements, and meets all the performance requirements.

I appreciate your bringing it up, quite frankly, because I think there is a principle involved. Congress has been encouraging us to compete our acquisition. If Congress turns this thing around, I think it will send a very bad signal to the Defense Department.

Senator **Sasser**. My time is up.

Thank you, Mr. Chairman.

SS-X-24 MOBILE MISSILE

Senator **Rudman**. Before calling on Senator Johnston and yielding back to Senator Stevens, I want to follow up a question that Senator Sasser asked. He characterized the President's comment on the Soviets' SS-X-24 mobile missile as being destabilizing.

There is a significant difference between that and our planned mobile missile. The SS-X-24 is a MIRV'd missile.

Am I correct? Has that been publicly stated?

Dr. **Cooper**. It is MIRVed.

Senator **Rudman**. Our Midgetman, if it were to go mobile, is a single warhead. Obviously, I won't argue which is more destabilizing, but certaily if you are going to talk destabilization, four or five is better than one.

Dr. **Cooper**. Two keys, number of warheads and accuracy.

Senator **Rudman**. Thank you.

Senator Johnston.

Senator **Johnston**. Thank you, Mr. Chairman.

OPAQUE CONDITION OF OCEANS

Dr. Cooper, CNO Watkins says the oceans are getting more opaque rather than more translucent.

Do you agree with that?

Dr. Cooper. Senator, I really can't comment on that because it has been at least 3 years since I have even worked in that area. I have just been focusing on Air Force programs.

I am not trying to evade your question; I just can't answer it.

Senator Johnston. I am sure the commodores will agree with that.

Dr. Cooper. Can I make one comment, though; I think one thing that helps greatly is that Congress has supported the extremely low-frequency submarine communications system. From that point of view, allowing the submarines to run deeper is certainly going to make the oceans more opaque. That is a very positive feature.

Senator Johnston. I am a strong proponent of the Trident Program and the D-5 missile. From the standpoint of the Air Force, I wanted to see if you see any weak points in it that I don't see or maybe the Navy would not be so anxious to volunteer.

Dr. Cooper. I do see one thing where the ICBM force helps that. When you look at the Soviets' problem of trying to contend with the triad, if they didn't have to contend with the ICBM force, it would allow them to free up assets that could be used to concentrate on the submarine force.

Senator Johnston. It is good to have the triad and I support that idea, but you don't see any special weaknesses in the Trident other than those that are obvious?

Dr. Cooper. No, sir; and the Air Force is fully supportive of the D-5.

Senator Johnston. Thank you.

MX DEVELOPMENT

When will the MX trigger be pulled in the sense you make contracts that we can't get out of? For example, on the B-1 bomber my studies indicated we are far enough along with the B-1 Program that it would be a mistake under the guise of cutting the budget to try to go back and cut that program back or even to alter the pace of weapons delivery because it costs you a lot more than you gain.

When will those particular dates come about on the MX?

Dr. Cooper. You can always pull the plug, but the production lines for the Peacekeeper are up and running right now. We are at full speed. We have 42 missiles that have been authorized and appropriated.

As we mentioned during the debate on the release of the 1985 funds, all our vendor bases are in place. The primes are churning away. So, for all practical purposes, we are approaching rate production right now.

Senator Johnston. On 45 missiles?

Dr. Cooper. On 42, 21 and 21 from the previous 2 years. We have 48 requested this year.

I just made a couple of notes because I thought this question would come up. With the 1985 appropriations, 48 percent of the Peacekeeper Program is funded. We are just about halfway there.

If we were to receive permission to go forward with the 48 in 1986, two-thirds of the program would be fully funded.

Now, as far as our comment on the B-1, with the 1986 appropriations we will be 99 percent funded on the B-1 program. There will be a small amount of R&D money left for future testing.

So, we do have the Peacekeeper production line up and churning right now. Our production readiness is high.

FLOOR AMENDMENTS AFFECTING MX

Senator JOHNSTON. There are two amendments out there on the floor, one by Senator Hart on the MX which I believe stops production and one by Senator Nunn which will cut back, I think it will be 24 a year, if I recall correctly.

Are you familiar with the two amendments?

Dr. COOPER. I am not familiar with the specifics. I know there is an amendment that will either cap the deployed missiles at 40 or 50 missiles and then provides a minumum sustained rate beyond that.

Senator JOHNSTON. Maybe the Nunn amendment is 48 with 12 a year.

Dr. COOPER. It could be 12. I will tell you where the 48 and 12 missiles come from. The reason we requested 48 this year is that that is the optimum production rate. Four a month we believe gives us the best economy of scale. If you are going to cut it back, we think the minimum sustaining production rate per year is 12.

You pay a tremendous price in building 12 per year as opposed to building 48 per year when you look at the unit cost of the missile.

Senator JOHNSTON. If you stopped the program altogether, as the Hart amendment would, do you know what the cost would be?

Dr. COOPER. There would be a termination cost associated with that, but I don't have that off the top of my head. I will be happy to try to supply that for the record.

[The information follows:]

MX TERMINATION COST

Since the production buys are fully funded, termination costs would not be applicable. However, even with no missiles procured in FY 86, there would still be an FY 86 funding requirement for $1730 million (R&D—$784M; Procurement—$890M; Milcon—$56M) to continue the R&D program and to deploy missiles procured in FY 84 and 85. There would also be additional costs, over and above currently projected procurement costs, to restart the production capability at a later date to procure the 123 test missiles which are required to meet JCS confidence requirements over the life of the system.

COST ESTIMATES ON MX TERMINATION

Senator JOHNSTON. The sooner you can get that, the better because the horse may be out of the barn unless you get it by——

Dr. COOPER. We have not done that particular exercise. I would like to tell you that the cost would be horrendous and not to do that.

Senator JOHNSTON. If you can give us your best estimate sometime today, if you could deliver that, because the amendments will be up today.

Dr. COOPER. Would you like that delivered to your office, sir?

Senator **Johnston**. Yes; I would appreciate that, if you can, find out what the amendments precisely do. We can get copies of those if you don't have them.

I would like to get those, and estimate what the cost would be.

Now, Dr. Cooper, if you are under the crater, there is nothing you can do on hardening.

Dr. **Cooper**. If the missile silos are in the crater of a nuclear explosion, they will have been taken out of commission.

CRATER SIZE FROM SOVIET MISSILE

Senator **Johnston**. How big is a crater on a typical Soviet missile?

Dr. **Cooper**. It depends on a number of things. It depends on the soil conditions, height of burst and the yield of the warhead. I don't have the crater diameter off the top of my head.

Senator **Johnston**. Do you know approximately?

Dr. **Cooper**. In terms of diameter, let us say for a SS-16 size warhead with nominal geological conditions, you are probably talking 500 feet in diameter, 250 feet in radius.

Senator **Johnston**. They will have a CEP of——

Dr. **Cooper**. You would have to take half of it. With the characteristic you are mentioning, you need to look at the radius.

Senator **Johnston**. They will soon have the capability. I don't know if that is classified.

Dr. **Cooper**. I don't think they will have a 200-foot CEP anytime soon. That is extremely accurate for any type of weapon.

COST OF SUPERHARDENED SILOS

Senator **Johnston**. You say $10 billion gives you 50 MX superhardened silos; is that correct?

Dr. **Cooper**. That is our best estimate right now. That is a very rough order of magnitude.

Senator **Johnston**. I understand. It looks to me as though that is a very bad investment because for $10 billion, how many missiles can they get?

They ought to be able to get 1,000 warheads for $10 billion, could they not?

Dr. **Cooper**. I think it is clear, Senator, that is an area we are going to have to work on in our development program to see if we can find ways to reduce the cost of superhardened silos, because they are very expensive right now.

Those are early estimates. We are hopeful that we will find more efficient production techniques and ways to reduce that cost.

Senator **Johnston**. Wouldn't $10 billion give us about 1,000 warheads?

They say 100 MX's——

Dr. **Cooper**. A hundred Peacekeepers are $16 billion in 1982 dollars. That will give you a feeling for what we are talking about on superhardened silos. That is an apples to apples comparison; $10 billion in 1982 dollars for the silos—$9 billion is our actual estimate.

Senator **Johnston**. Let us say it gives you 500 or 600 more warheads. With 500 or 600 warheads, you ought to be able to take out

50 superhardened MX silos just by the redundancy of putting enough rounds on them.

It looks to me not to be very cost effective.

Dr. **Cooper**. That is certainly a consideration we are going to have to look at when we make a decision whether or not we want to deploy superhardend silos.

Senator **Johnston**. I think you would do better to give CNO Watkins more of his Trident submarines out there.

Dr. **Cooper**. I might mention in the arms control arena if we can reduce the number of warheads or at least hold them constant, that partially mitigates our ability or the Soviet's ability to put that many warheads on a single target.

STRATEGIC DEFENSE INITIATIVE

Senator **Johnston**. Now, Dr. Cooper, almost all the experts, actually all the experts I have spoken to, say that when you come to SDI, that nobody really believes that SDI can ever give us the capability of having a sort of astrodome over the United States which would defend cities, point targets, everything, that that really is not what it is designed for.

Do you agree with that?

Dr. **Cooper**. I don't agree with that yet. I think we have to look at our research program. That certainly is a worthy goal. It is a very, very challenging goal to have a leak-proof system.

I would only suggest that I don't think it is necessary to have a totally leak-proof system for it to be an effective deterrent.

Senator **Johnston**. Do you think that we as policymakers ought to be spending money aiming toward a leak-proof system?

Dr. **Cooper**. I don't think that right now we have to make a decision whether or not we are going to try to deploy a leak-proof system. We are looking at the technology. We are going to be a number of years looking at that. It will be some point down the way before we even have to make a decision as to what type of system we are going to have to deploy.

I don't think it in any way constrains us right now to look for a leak-proof system. The types of technology we will look at will be essentially the same.

OPPOSITION TO SDI

Senator **Johnston**. You would disagree then with these experts who say, look, this thing was never designed for that, it is totally fanciful to think about a leak-proof system, forget that, that is crazy, wild talk?

I have heard those kinds of terms used by people I respect very much and I have to believe that. But you think that is wrong? You think there is a real possibility and we ought to do the research and then it will become clear later?

Dr. **Cooper**. I think in the normal progression of things the first thing we should do is deploy a more modest system and build on it with time. My only point is that we should not say we are not going to look for a leak-proof system at some point in time. There is no reason to say that right now.

Senator **Johnston**. I think there is, to be honest about it. Nobody thinks that is really so?

Dr. **Cooper**. I would say it is very stressing. I don't see why we should discount it out of hand at this point. That is one of the things we are trying to determine in our research and technology program.

SDI right now is a research and technology program.

Senator **Johnston**. You get a gold star for a loyalty to the Gipper.

Dr. **Cooper**. Let me mention one thing, though. If it were possible to catch the Soviet missiles in the boost phase, that is a relatively small number of vehicles compared to what would happen once the missiles deploy all their warheads. If we could come up with a system that would catch all those missiles in the boost phase, there is no reason that you couldn't have a leak-proof system.

Having said that, that will be an extremely challenging task. I don't see any reason why we should preclude ourselves from working on that right now.

General Abrahamson is not precluding that option—at least the last time I talked to him—all options are open

Senator **Johnston**. I appreciate the fact that you are going to be loyal on that. I think for me and for a lot of us, it really detracts from the credibility of the whole effort when we have that vain hope our there of its being a leak-proof system. Nobody really believes that.

We could be talking about putting a colony on Mars. We know it may be possible. It is a fanciful thing that makes me think if that is what we are spending $3.7 billion for, we ought to cut back a lot because it does not make sense.

Dr. **Cooper**. I don't think that is what we are spending $3.7 billion for right now. There are a lot of options less than a leak-proof system that could be very attractive to us.

Senator **Johnston**. What we ought to do is make the administration give some real doable goals and think that through so that we can make meaningful choices.

Dr. **Cooper**. I think that will be forthcoming. In fact, General Abrahamson in a meeting we had with the Secretary of Defense talked about the various architectures that we ought to start looking at.

It is a bit premature to do that. We need to do some more technological work before we come up with a long-term plan on how we are going to deal with that program.

Senator **Johnston**. You are a good witness. My time is up. Thank you.

Senator **Stevens**. The more important thing is that the Russians know it is not impossible. They have been at it since the 1960's. So, let us not rule out the fact that they don't believe it is impossible. They wouldn't be spending the money they have been spending if they did not think it was possible.

I am sorry to have been delayed. I sort of feel I just came to school on show and tell.

What is the screen for?

Dr. **Cooper**. We have not used it yet, Senator. We have been pretty good about that today.

Senator **Stevens**. What was it for?

Dr. **Cooper**. In case you had specifics about programmatic details, we are prepared to go into that in detail if you would like.

Senator **Stevens**. Maybe I can press a button.

You are next.

Senator **McClure**. Thank you very much.

SDI DEVELOPMENT

I don't mean to get into a debate with Senator Johnston today because I agree in the main with the idea that if SDI has to be 100 percent leak-proof, 100 percent effective to be worth anything, then we probably shouldn't be involved in it.

But if it is worth the money at somewhat less than 100 percent effectiveness, we need to focus on that without abandoning the hope that perhaps it might be 100 percent effective.

I guess, again without being too personal about it, the people of Louisiana and the people of Idaho don't demand 100 percent effectiveness from their Senator before they vote for him. Certainly that is true in the case of the Senator from Idaho. It may not be absolutely true of the Senator from Louisiana. They still vote on me, they have a 100 percent.

Senator **Johnston**. They have 100 percent, 10 percent on mine.

Senator **McClure**. We sometimes settle for less than perfection because we think less than perfection is still worthwhile.

Dr. **Cooper**. On SDI, Senator, from the point of view of the survivability and the effectiveness of the triad, I can envision an SDI system that does not have to be 100 percent leak-proof, but would greatly increase the deterrent level to the Soviets. It is something they have to contend with, and it is another level of uncertainty in their planning.

Senator **McClure**. Even if it is less than 100 percent effective, it may be 100 percent effective with respect to certain targets and that has to raise their anxiety level considerably.

Dr. **Cooper**. It may be 100 percent effective, too, in bringing them to the negotiation table and in giving them the incentive to negotiate in good faith and reduce the levels of offensive weapons.

Senator **McClure**. The only concern I have with SDI, very honestly, Mr. Secretary, is the notion that somehow to employ antiballistic missile defenses is only R&D and only a long time in the future, and ignores the capability that we have now to engage in some of it now.

There is a debate from our perspective in that regard, that the political debate is forcing us to forego an option that might be of infinite value to us in the much shorter term.

Dr. **Cooper**. Of course, the tradeoff there, Senator, is in terms of dollars. Given relatively limited resources, if we were to embark on a deployment program today, that would cost a considerable amount of money, and that would be money that could be put toward research that might lead to a more robust system 5 years from now. Those are the balancing acts we go through.

Senator **McClure**. That is true in every weapon system, the current readiness versus future capability argument. I guess maybe as in most cases, I would strike a balance between the two rather than putting all of my hopes on one or the other.

Dr. **Cooper**. I think that was the point, too, that Senator Johnston was making. That is if we go for the brass ring and are only willing to field a leak-proof system, that could be very far in the future before we even start to deploy a system.

I think what you are going to see is that we will probably do something less than that in the nearer term, but that decision has yet to be made.

SOVIET SATELLITE DETECTION OF U.S. SUBMARINES

Senator **McClure**. It has been reported in the press that the Soviets are developing the capability to detect submerged U.S. submarines from satellite observation.

Is that correct?

Dr. **Cooper**. I will punt that one to the Navy. I am sure they will tell you that we will have to go into a higher level of classification to go into that.

Commodore **Lewin**. Dr. Cooper is correct, we would have to go to a higher level to pursue that in any detail.

However, there is no indication that the Soviets are doing more than basic research, as are we, in the satellite ASW system. There is no breakthrough that we see in the foreseeable future to affect the ASW survivability of our submarines.

SOVIET EFFECTIVENESS UNDER SALT TREATIES

Senator **McClure**. Mr. Chairman, at some point we need to cover that aspect as well as some others of ASW so that we can put in balance what a strategic program ought to be. If the Soviets are already breaking out of SALT II, and I say if, and I don't think that is really a question, the deployment of advanced missile systems, along with the violations of the limitations of SALT I and II has allowed them to increase over the levels that were contemplated at the time SALT I and II were negotiated, but let us focus now on what they are doing with and without treaties as we see what they are preparing to do.

How different would their forces be in the absence of SALT II?

Dr. **Cooper**. I guess I am not sure of the thrust of your question, Senator. How different would they be?

Senator **McClure**. Is SALT II constraining now or over the next few years what in the main they are going to be doing?

Dr. **Cooper**. Certainly in the types and numbers of systems that they would be able to deploy in the absence of an arms limitation treaty it would be higher.

Senator **McClure**. I am not talking "a," I am talking "the" arms control.

Dr. **Cooper**. If we don't have SALT II, we don't have an arms control treaty that limits——

Senator **McClure**. Is SALT II constraining any of the weapon systems that they are preparing to deploy?

Dr. Cooper. I think it constrains a lot of the weapon systems that they otherwise might deploy. We had an argument on the SS-24 and SS-25, whether or not they are in compliance with SALT II.

Senator McClure. I didn't think there was any argument except from their side.

DEPLOYMENTS UNDER SALT TREATIES

Dr. Cooper. That is what I am saying. Under SALT II we were allowed to deploy one new ICBM. Ours is the Peacekeeper. We think they have two new ICBM's in the SS-24 and SS-25.

Senator McClure. Plus one other that is arguable from our standpoint.

Dr. Cooper. Yes.

Senator McClure. That makes it three.

Dr. Cooper. With regard to the ABM Treaty, we think that the radar at Krasnoyarsk is in direct violation.

KRASNOYARSK RADAR

Senator McClure. Is the ABM Treaty stopping them from building the radar at Krasnoyarsk?

Dr. Cooper. Apparently it has not. We think it is a battle management radar looking the wrong way.

Senator McClure. That is my question. What is it that the treaty is restraining?

Dr. Cooper. In our opinion, it has not constrained those particular systems, but I think it constrains other systems, and it certainly has constrained numbers of systems.

Senator McClure. It has constrained them up to this point if you ignore some of the things they have done that were beyond the numbers that we attribute to the agreement; is that not correct?

Dr. Cooper. That is true.

Senator McClure. In estimating the numbers of warheads on the Soviet ICBM force, should these factors, all of these factors, be considered?

One, the maximum demonstrated loading capability for the super heavy SS-18. That is a factor we should consider; is it not?

Dr. Cooper. In fact it is a factor you did consider when you decided not to ratify SALT II.

Senator McClure. The deployment of first increments of SS-24 and SS-25 mobile ICBM's?

Dr. Cooper. Yes.

Senator McClure. The reload and refire capabilities of most Soviet ICBM's, those are factors that should be considered as well, should they not, in calculating the number?

Dr. Cooper. They should be considered and on that point in terms of cold launching and ability to reload a silo, I don't believe that the treaty constrains that. But where you run into a problem is our ability to verify whether or not they have additional missiles hidden in warehouses somewhere.

RELOAD AND REFIRE CAPABILITY

Senator **McClure**. The treaty does restrain reload and refire capability. The question is whether or not they are constrained in practice and whether or not they have deployed already deployed mobile ICBM's is also a factor that must be considered; is it not?

Dr. **Cooper**. Yes, SS-16, to state one.

Senator **McClure**. What progress are the Joint Chiefs of Staff and Secretary of Defense making on the military implications of Soviet violations of the strategic arms limitation treaties which are required by July 15?

Dr. **Cooper**. Senator, I can't answer that. I have not been involved in that particular report.

REACTOR RECORING OF POSEIDON MISSILES

Senator **McClure**. How much would be required to recore the reactors of the 10 oldest Poseidon submarines?

Commodore **Lewin**. Senator, recoring and refueling the oldest Poseidon submarines and overhauling the ship would cost approximately $175 to $190 million per ship, depending on the individual contract.

Senator **McClure**. And there are about 10 of those?

Commodore **Lewin**. We have 31 Poseidon submarines, sir, and 19 of those are equipped today to carry the Poseidon weapon.

Senator **McClure**. That would be somewhat less than $2 billion to do 10?

Commodore **Lewin**. Yes, sir.

Senator **McClure**. What is the cost of one Trident submarine to be built in the 1990's?

Commodore **Lewin**. About the same price.

Senator **McClure**. So, you get 10 refitted Poseidons for the price of one Trident?

Commodore **Lewin**. You have 10 ships, sir, that don't have the capability of the D-5 or the Trident I missiles, built with the 1950's and 1960's technology.

Senator **McClure**. I understand the limitations. But the mathematics are correct?

Commodore **Lewin**. Yes, sir.

Senator **McClure**. The same number of warheads?

Commodore **Lewin**. For the same number of tubes, Senator.

Senator **McClure**. It is about a 25-percent difference.

Commodore **Lewin**. Twenty-four tubes in a Trident submarine, 16 tubes in a Poseidon submarine. There is a different number of warheads, a classified number, for the Trident weapon compared to the Poseidon.

Senator **McClure**. Why should Congress provide funds to deploy the MX in nonsurvivable silos while at the same time the administration is planning to dismantle highly survivable Poseidons?

Dr. **Cooper**. I don't believe, Senator—again, I am getting a little bit outside my area of expertise—that deploying Peacekeeper is causing us to decommission the Poseidon to remain within treaty constraints.

Perhaps the Navy can comment on that.

Senator McClure. It is the deployment of the Trident that is pushing the dismantling of the Poseidons. If we are going to dismantle Poseidons, why are we building the MX? It is cheaper to keep the Poseidon.

Dr. Cooper. The Poseidon does not represent the capability that the Peacekeeper missile represents.

Senator McClure. It does not represent the cost either.

Dr. Cooper. That is true, but there is a trade-off with cost and capability in terms of prompt response, hard target capability, it is very essential we go forward with the Peacekeeper.

Senator Stevens. Your time has expired.

ADVANCE PROCUREMENT FUNDING

Commodore, it is my understanding in this budget we have $312-plus million for procurement, of which $124 million is for equipment at Kings Bay, GA, and $137 million for production tooling and equipment. This is under the Trident missile funding strategy team.

My staff tells me that by 1990 under your plan the Congress will have provided almost $1 billion, about $800 million more in advance procurement funding than is needed to be expended during the period.

In other words, we are advance funding beyond your production needs.

Can you tell me why so much advance procurement is needed under the Navy Strategic Missile Program as compared to the Air Force?

Commodore Malley. No. 1, I don't know what the Air Force has, so I can't make a 1-for-1 comparison.

Senator Stevens. They are not asking for as much money in advance.

Commodore Malley. I can go down how we laid out our advanced procurement program. One of the things we tried to do in laying out that program was to minimize the full-funded cost in earlier years.

PRODUCTION CONTINUITY FUNDING

Senator Stevens. Tell me what this $205 million for production continuity funding is for. It looks like it is to buy parts and components that won't be needed for several years.

Commodore Malley. You quoted $250 million?

Senator Stevens. $250 million.

Commodore Malley. I have broken that down in four different areas. The major area you are talking about is what we call production continuity with leadtime considerations. That amounts to $172.3 million of that amount.

Senator Stevens. We are on page 2 of item 4, it is an unclassfied document, dated February 1985. It says that you have production continuity, $205-plus million.

Commodore Malley. Yes.

Senator Stevens. If you have to have production continuity, why don't you call it multiyear funding and ask for multiyear authority? You don't have multiyear authority under this item.

Commodore **Malley**. We do not.

Senator **Stevens**. It is costing more money the way you are doing it. Why don't you ask for multiyear funding?

Commodore **Malley**. Our approach to this, in my opinion, was to minimize any cost in any given year. We looked at all the different components that make up the missile itself. There are four categories in the $200-some million you are referring to of which some of it is traditional production continuity.

The major item again is the items with leadtime considerations. They are a larger series of parts. For example, resistors, diodes, large-scale integrated circuits, and the biggest group of all is the MK-6 guidance system, which is our new guidance system for Trident II.

There are more than 80 configurations of semiconductor parts.

Senator **Stevens**. That same page shows you have $54,200,000 for guidance systems, reentry systems, and long-lead subcomponents. It looks to us as though you are getting into a situation where you have a new form of multiyear funding without saying so and that our advanced procurement is going to be very costly.

I held hearings down at Kings Bay, you know. It was our impression then that the MILCON money had been requested in advance of actual need and that the equipment portion of our bill was forward funded.

You know, if we give it to you, you are going to take a hit somewhere else because those figures are out on the floor right now. I think you have to take a look at the need for these forward funded items and give us some priorities. We have said this before to Secretary Cooper here.

I hope you will do that. I don't see any reason to build up almost $800 million in surplus moneys in a procurement account that you don't need until beyond the 1990's. That is our estimate of it.

I would appreciate it if you would review it for the record.

Commodore **Malley**. Yes, sir, we will be happy to do that.

[The information follows:]

MATERIALS BUILDUP

The reason for the buildup of material is to protect the reliability and quality of our TRIDENT II missile procurements, which run from FY 1987 through FY 1999. The $800 million is not, in fact, surplus but will be used to support this complete production run. I would now like to review briefly the history and application behind our unique and highly successful advance procurement philosophy.

The TRIDENT II (D-5) advance procurement program consists of both traditional, or Long Lead, advance procurement and Production Continuity advance procurement. Long Lead provides for those items with production leadtimes significantly longer than those of the using end items themselves. Production Continuity, by contrast, is required for those critical items which must be procured earlier than leadtime considerations alone would dictate. Advance procurement of such items is necessary to assure their continuous manufacture at minimum, uninterrupted rates essential to maintaining consistent product uniformity and performance reliability. Since the preponderance of funds requested in the D-5 advance procurement P-1 line has been categorized as Production Continuity, the ensuing discussion will focus on this exception to standard lead-time-away advance procurement budgetary practice.

The Production Continuity advance procurement approach had its genesis in the experience gained from the POSEIDON program. Among the lessons learned was th eneed to prevent problems with certain critical components which could be traced to their lack of homogeneity. This could principally be attributed to those situations where annual production requirements were too low to support continuous production lines. Consequently production would stop and restart. These interruptions resulted in the introduction of changes in materials and manufacturing procedures which adversely affected the reliability of certain components and ultimately were directly responsible for some missile flight test failures.

The TRIDENT I Production Continuity program was designed to address these problems and it did so successfully. It provided for the procurement of various components and materials at continuous production rates on controlled lines which provided consistent quality and would support missile and guidance production schedules. Whereas leadtimes are the decisive consideration in determining when to budget for Long Lead requirements, the criteria for budgeting for Production Continuity items are quite different. The overall objective of production continuity is to manage a commodity procurement program with attendant control techniques to assure availability of materials and components at the level of quality, reliability and homogeneity required to meet the following system performance objectives:

1. Achievement of missile reliability as soon as possible after deployment and maintenance of that reliability throughtout program life.
2. Assurance of source of supply for parts and materials, and
3. Maintenance of program schedule.

In addition to these production continuity requirements which are based on the need to produce materials and components at the lowest rate required to assure the desired quality and reliability, there is a second form of production continuity: the life-of-type procurement. Life-of-type, or one-time, procurements of the quantities of materials or components needed to support the total planned program are necessary when any of the following conditions are met:

1. Minimum production lots equal or exceed total program requirements.
2. The supplier intends to discontinue production of a required item.
3. The supplier intends to interrupt production or to relocate his production facility with attendant unacceptable requalification costs, or
4. The supplier is a foreign source whose continued participation can not be guaranteed.

The proofing of the production continuity concept has been achieved during the TRIDENT I missile flight test program, for we have not had one flight test failure—not even one flight test anomaly—caused by any material or component procured with this methodology. The purpose of the production continuity program is to assure missile system reliability during flight. The TRIDENT I test results support, in the strongest possible way, the validity of this procurement strategy.

MARV

Senator **Stevens**. Mr. Secretary, why can't the Air Force and Navy consolidate ballistic missiles technology programs on reentry vehicles, MARV's and penetration aids, rather than pursue separate research and development programs?

Dr. **Cooper**. That is a good question, Senator. We have been looking at that. In terms of the MARV, the Navy technique on the submarine-launched ballistic missile is different than the Air Force technique on the ICBM.

I have to be very candid and tell you that is the extent of my knowledge. Maybe the Commodore wants to comment on this.

One uses the tail control; the other uses a nose control technique.

Senator **Stevens**. We have some paper from the Air Force on the MARV Program. It does not seem to be cost effective to put those penetration aids on just a limited number of these missiles.

It would seem that we ought to try to put these research and development programs together as they begin rather than try to put them together later.

Dr. **Cooper**. That is being looked at in the Office of the Secretary of Defense. That has been an issue for the last year, whether or not the Navy and the Air Force should go together in the advanced strategic missile systems.

Right now it is an Air Force only program. I really can't comment on what the Navy is doing.

By the way, MARV as for the Air Force is a technology program only at this point in time. We have no plans to deploy MARV. We are simply doing technology work on it.

Senator **Stevens**. I have some specific questions on that that I think maybe should be answered for the record.

I understand, Senator Andrews has to leave. he will be next. Let me defer to him and then I will come back to my questioning.

Senator **Andrews**. Thank you, Mr. Chairman.

We have a markup on the farm bill. What we are talking about here is extremely important, too.

MX BASING RESEARCH

Secretary Cooper, are you doing any ongoing research on basing of the MX in other than silos?

Are you taking a look at rail mobile or have you crossed that off?

Dr. **Cooper**. Senator, the only other basing mode besides putting them in the current silos is the superhardened work that we are doing. We are looking at that actively right now.

Senator **Andrews**. You are still sticking with the silo thing that the President and some of us campaigned against in 1980?

Dr. **Cooper**. Yes, we are. Our current plan is to deploy 100 Peacekeepers in existing Minuteman silos. We are doing research on superhardened silos.

Senator **Andrews**. The point is we were looking at that window of vulnerability in 1980. You still leave us with no out because many of us made a good deal of statements along with the President's statement saying that if these things are in targeted silos, they are not good and that gives us a window of vulnerability.

Then if we put the 10-warheaded missile in the same silo that we now have a 3-warheaded missile target, that is cost effectiveness for the Soviet Union.

Yet you are saying you are not doing any kind of studies to get away from it.

Dr. **Cooper**. That is where the small ICBM comes in. The President's Five-Point Strategic Modernization Program to strengthen the triad.

Then when the Scowcroft Commission came forward and recommended in addition to that program that we move out at the fastest prudent pace to deploy a small single-warhead ICBM that will be deployed initially in a mobile mode.

Senator **Andrews**. You are accepting the vulnerability of the MX in a silo base. When you move toward the small ICBM, are there strong possibilities that we might see a mix of basing modes for it such as soft mobile, hard mobile and hardened silo configuration?

Dr. **Cooper**. We have not ruled that out nor did the Scowcroft Commission. Our baseline program is for the hardened mobile launcher.

As you point out, we are also looking at the other options.

SMALL ICBM DEPLOYMENT

Senator **Andrews**. Have there been any studies concerning which States would have the small ICBM deployed in silo configurations if you go that way?

Dr. **Cooper**. We are right now doing site surveys on 46 different locations around the country that will look at those various issues.

Senator **Andrews**. And that is to get a number of different configurations?

Dr. **Cooper**. All different configurations.

Senator **Andrews**. But so far no ongoing studies on the MX other than the silos?

Dr. **Cooper**. No, just superhardened silos which would be a follow-on option.

Senator **Andrews**. Thank you, Mr. Chairman. I appreciate the time.

Senator **Stevens**. Thank you.

MULTIYEAR PROCUREMENT OF B-1 BOMBER

Mr. Secretary, one of the real things that you have accomplished is the B-1 Bomber Program under the multiyear procurement concept.

It is my understanding you now have a surplus of appropriated funds. We estimate that about $1 billion of prior appropriated funds have been saved by virtue of the way you have handled it in terms of administering this multiyear program.

Now, last year we directed that the excess funds from the B-1 Program be deleted by a formal budget amendment.

Is that going to happen?

Dr. **Cooper**. There are two parts to your question. The assertion that we have $1 billion of excess funds, which I do not believe is correct.

We currently have funds that we have yet to obligate, but that are committed against work packages.

Senator **Stevens**. Against what?

Dr. **Cooper**. Against validated work packages. We have not spent the funds yet, but we will spend the funds. They do not represent savings in the program. We will not know how close we come to the $20.5 billion cap until roughly mid-June of this year, and I believe that Congress has directed us to submit a formal budget amendment if, indeed, we have savings and will comply with that.

OUTCOME FOR PRIOR YEAR APPROPRIATIONS

Senator **Stevens**. We are asked now for $5.5 billion to complete the 100 aircraft and we are told that $367 million for the engineering change orders was frozen by the Secretary. Now we are about to the point where we are going to have that 100 bombers.

I think before we act on the request in the 1986 budget, we need to know what is going to happen with the prior year's appropriations that have not been committed and appear to us to be excess to the needs unless there is going to be a series of engineering changes or that you want to run the line beyond 100 bombers.

It is my understanding you are only authorized to go to 100. If we are right, you don't need $5.5 billion.

Dr. Cooper. Senator, I hope you are right in that we won't need $5.5 billion, but we can't give you that answer until Gen. Bill Thurman completes his negotiations with the three remaining associate contractors.

I anticipate that will be done at least to the point that we can report back to you by mid-June. I am hopeful there will be some savings, but it is nowhere on the order of what you mentioned in your statement.

SAVINGS ON B-1 ENGINE CONTRACT

Senator Stevens. An audit by GAO in November found that you had $352 million savings on the B-1 engine contract alone.

On March 1 it was reported you had $767 million of fiscal year 1983 and fiscal year 1984 funds still unobligated.

There is $367 million frozen under the Secretary's order.

I know some of those are overlapping. Our estimate is somewhere around $1 billion appears to have been saved by the program. If that is so, we would like to take it into account.

Dr. Cooper. I understand.

Senator Stevens. And make that reduction.

Dr. Cooper. Could I address those three issues that you have raised?

Senator Stevens. Yes.

Dr. Cooper. The savings on the engine contract is a true savings on that contract, but, as you know, we have four associate contractors. Our task is to try to put together a little mosaic. The fact that we saved some money on the engine contract does not necessarily mean we have an overall savings; those savings may be needed to offset coming in over target on another contract.

I am not privy to all the details of General Thurman's negotiations right now. Until we have all four of those contracts negotiated, we won't be able to tell you what the bottom line is in terms of savings.

On your point about the funds that are yet to be obligated, while they are not obligated, they are committed. There is valid work against which these funds need to be placed. Those do not represent savings in any way.

In terms of the engineering change orders, I am not aware that Secretary Orr has frozen those. We are staying within the baseline program, the baseline design, but engineering change orders are a fact of life as we go through our flight test program.

Senator Stevens. Just the design I said was frozen.

Dr. Cooper. The design is frozen, but there will be a need for engineering change orders as we continue to move with the program over the next couple of years. Those are not major design changes where you are completely redesigning the aircraft, but we do find problems that require us to go in and make changes.

I think the amount you cited is only roughly 6 percent. That is kind of low in terms of what we normally budget for engineering changes.

COMPETITIVE BIDDING

Senator STEVENS. My time has expired. Let me tell you as I came in I heard a comment about this problem of the results of competitive programs being upset by action in either House or attempts to do so.

I want to tell you I think I speak for Senator Stennis, and I am fairly sure my friend here from Wisconsin will agree, this committee will look with great disfavor on any attempt to upset the results of the competitive process.

We have driven awfully hard and pushed you awfully hard to get into that mode. If politics raises its ugly head in terms of offsetting the savigs we can bring about by virtue of competition, we are going to get extremely disturbed.

We would like to have you let us know if someone is trying to put the heat on you. There may be a few other items in this bill we are interested in.

Senator PROXMIRE. If the chairman will yield, I concur heartily with your statement. There is a saving of 20 to 25 percent by being competitive.

Dr. COOPER. Thirty-three percent.

I normally don't testify on reprogramming actions, but I feel so strongly about this, not in terms of the munitions lift trailer itself, but in terms of the principle of competition.

I will be the witness tomorrow. I can't speak for what the committee is going to do. I hope I will be articulate enough to persuade them that it is everyone's best interests to go forward on this. It has been an issue that we have been on hold for, for 5 months.

We made our decision in December. We have had a contractor on hold for 5 months, spending his own resources to keep his team together so that he can maintain the schedule. I am hopeful that the other congressional body will support us in our efforts to inject more competition into our acquisitions.

Senator STEVENS. We certainly will, I am confident of that. The majority of this committee will.

Senator Proxmire.

SLBM FLEET

Senator PROXMIRE. Commodore Malley, will you give me your estimate of the invulnerability of the SLBM fleet on station to a preemptive attack in a range of 1 to 10, with full vulnerability being 10?

In other words, if it is fully invulnerable, that is 10. If it is highly vulnerable, that is 1.

Where would you rate the SLBM fleet on station?

Commodore MALLEY. I would go with the 10 if that is the highest we can go.

Senator PROXMIRE. Maybe you would go to 11 if we permitted that.

The D-5 system has the option of carrying more MK-4 warheads now carried on the Trident I (C-4) system or going to the hard target killer, the MK-5 warhead.

In an agreement with the Russians to reduce warheads overall as the President has proposed, how will the Russians know the number of warheads on the D-5 system if they are interchangeable in terms of numbers?

Commodore **Malley**. In reality it depends on what we test.

Senator **Proxmire**. Would this be a verifiable agreement for either country?

Commodore **Malley**. The way I understand the rules right now, once you have tested and demonstrated that you have that certain capability, then every missile would count; for example, if you had 12 or 15, whatever number.

Senator **Proxmire**. You would have to make the assumption they all had the warheads?

Commodore **Malley**. Yes, sir.

DESTRUCTIVE CAPABILITY OF D-5 SYSTEM

Senator **Proxmire**. Commodore Malley, do you believe the D-5 system has the capability of destroying any land-based Soviet ABM system that they could deploy in the next 15 years or so, given the fact that an ABM system is above ground?

Commodore **Malley**. I believe they would have the capability to destroy some ABM systems. Depending on the capability they have—you used the word they, it is kind of difficult to look into the future as to what they could deploy.

Senator **Proxmire**. Then you are telling me what is deployed now, you are confident that the D-5 could be effectively to destroy it?

Commodore **Malley**. I believe we would have enough total number of warheads to get through to get some of the ABM sites, yes, sir.

Senator **Proxmire**. To get what?

Commodore **Malley**. To get some of the ABM sites.

Senator **Proxmire**. By my interpretation, some can mean anything. Some can mean 1 percent or 90 percent.

Commodore **Malley**. I believe to get into the actual numbers, we would have to go into a classified session. We do have some capability to go against the ABM threat as we understand it.

Dr. **Cooper**. I think you would have to look beyond just the submarine leg and look at the Triad again, all three components.

I believe the current estimates are that our nuclear force is more than able to overcome what we see to be the Soviet's current day ABM system. We think that condition will persist over the next few years.

As you get out beyond the 10-year timeframe, it becomes more and more difficult to predict the outcome of that exchange.

IMPROVEMENTS ON D-5 SYSTEM

Senator **Proxmire**. As we get along the curve out there 10 years or so, we will also be refining and improving the D-5, I would think.

Dr. **Cooper**. That is correct.

Senator **Proxmire**. Coming on with an even stronger weapon.

Dr. **Cooper**. The things that the Soviets may not have on the drawing board today may come into being in the next few years. We are not able to predict much beyond the next 10 years.

ACCELERATION OF D-5 TEST SCHEDULE

Senator **Proxmire**. Could the flight test schedule of the D-5 missile be accelerated so that a test could be conducted prior to its planned schedule 19 months from now?

Commodore **Malley**. No, sir. I don't know any way to accelerate it.

Senator **Proxmire**. What is the current price of a Trident submarine, what is the total program cost of the Trident program, and what are the life cycle costs of a single submarine and the entire fleet of Trident submarines?

Commodore **Malley**. Approximately $1.6 billion is the current price of the Trident submarine.

Senator **Proxmire**. Of a Trident submarine, $1.6 billion?

Commodore **Malley**. Yes, sir.

TOTAL LIFE CYCLE COST

Senator **Proxmire**. What is the total program cost?

Commodore **Malley**. Total program through—you used the word total—total life cycle cost?

Senator **Proxmire**. Yes.

Commodore **Malley**. Thirty-some years?

Senator **Proxmire**. All right, yes.

Commodore **Malley**. I think I will have to take that one for the record.

Senator **Proxmire**. Give me whatever total you can give me. Tell me what it is. Be sure to give me that total for the record also, but give me what you can here.

Commodore **Malley**. Total acquisition cost in the December 1984 SAR is $16 billion $96 million.

Senator **Proxmire**. $16 billion $96 million.

Commodore **Malley**. That is for the submarine, the D-5 submarine.

Senator **Proxmire**. When you told me that the cost of a Trident was $1.6 billion, does that include the missiles and the warheads?

Commodore **Malley**. No, sir. Just the submarine itself and weapon system that goes onboard, less the expendable weapons.

Senator **Proxmire**. Give me the total cost including expendable weapons.

Commodore **Malley**. I would like to answer that for the record.

Senator **Proxmire**. What is the life cycle cost of a single submarine and entire fleet of submarines, life cycle cost and 30-year cost.

Commodore **Malley**. I will have to answer that one for the record.

Senator **Proxmire**. Of a single submarine and the entire fleet.

Commodore **Malley**. A single submarine and the entire fleet?

Senator **Proxmire**. Yes.

[The information follows:]

Life Cycle Cost of Trident

The total life cycle cost of the TRIDENT II program is estimated to be in the range of $80 billion in constant fiscal year 1983 dollars which is the base year used in the SAR's for the TRIDENT II program. Given that the current D-5 program, following the backfitting of the eight C-4 configured hulls, is based on a total fleet of seventeen Ohio class submarines, this figure averages to a life cycle cost of approximately $4.7 billion for one submarine.

These estimates are comprised of total acquisition costs for nine submarines and 700 missiles, costs associated with the backfitting of eight C-4 configured Ohio class hulls, costs in support of submarine overhauls through program life, costs for staffing and outfitting of the strategic weapons facilities, and operating and support costs of all submarine patrols, assuming that each Ohio class submarine remains in the force for 30 years.

INCREASE IN SOVIET WARHEADS

Senator McClure. Just to follow through on a couple questions I asked earlier and partly to follow through on what Senator Proxmire indicated, to indicate a couple of figures that don't tell the whole story. I don't think they do, but, nevertheless, tell a part of the story.

For the same amount of money to modernize 10 Poseidon's, you get 1,600 warheads. For the same cost of the Trident, you get 192, the same amount of money.

I think that is correct in terms of the level that we can go into in this hearing.

Commodore Malley. That number sounds right.

Senator McClure. If I recall the information correctly, the Joints Chiefs of Staff in 1978 estimated that in the absence of any limitation by treaty, no SALT I, no SALT II, that in the intervening 7 years, 1978 to 1985, the Soviet Union would have amassed a total of 2,700 delivery vehicles, 11,900 warheads. That was without any arms limitation agreement.

We have negotiated arms limitation agreements. Instead of getting 2,700 vehicles, they now have 3,200. Instead of getting 11,900 warheads, they now have 13,200.

Mr. Secretary, are those figures accurate?

Dr. Cooper. I can't validate those, Senator. I don't know.

Senator McClure. Will you do it for the record?

Dr. Cooper. I will try to do that.

[The information follows:]

Arms Limitation Agreements

Current Soviet inventory of SALT accountable Strategic Nuclear Delivery Vehicles (SNDV's) and weapons (warheads) as of June 5, 1985 are as follows:

[Deleted.]

[Deleted.]

MOBILE MISSILES ON ABANDONED RAIL LINES

Senator McClure. To follow up on one question that Senator Andrews asked, but put in a different way because I know of Senator Andrews long-time commitment to rail mobile, and even at one time offering that the people of his State and the people of the upper tier States would take abandoned rail lines and permit the deployment of rail mobile missiles on those abandoned rail lines throughout that part of the country, we have not done that and I think you have indicated we are not studying the MX rail mobile configuration?

Dr. Cooper. By the way the elements of that sort of technique are embodied in our hardened mobile launcher for the small missile. One of the drawbacks with that is that when you look at a rail mobile system, there is a very large perpendicular area and it takes a relatively small blast and overpressure to cause it to tip over.

You need very large areas of land, particularly given the figures you have just cited regarding the number of Soviet warheads to protect relatively soft mobile missiles. That becomes more like a soft road mobile-type system that requires a lot of land to roam around.

Senator **McClure**. There is a lot of land up there. If I recall, recently, watching U.S. reaction to the Soviet deployment, which has now been made public, of the SS-X-24, a rail mobile system, would our reaction have been different if the SS-X-24 had been placed in fixed silos?

Dr. **Cooper**. I believe it complicates our targeting problem. It certainly does if you go mobile as opposed to fixed silos.

Senator **McClure**. Our reaction was that there is a quantum leap in their capability because of the verification and targeting.

Dr. **Cooper**. And targeting.

Senator **McClure**. Thank you, Mr. Chairman.

Senator **Stevens**. Just a couple more questions.

OPERATIONAL TEST MISSILES FOR TRIDENT II

First, the requirement for operational test missiles for Trident II, and I know you have classified the number of operational test missiles, we don't know why you classified it, but, in any event, it is my understanding that the requirement for those test missiles comes from the same Joint Chiefs of Staff paper that applies to the Air Force.

We had a specific limitation on MX and we had a specific limitation on Pershing II. But it appears to us that you have an exceptional number of test missiles in this Trident request.

The total for the missiles on the Trident Program, as I understand it, is $72 billion. Now you are looking for more than twice the test missiles for the MX and Pershing. We believe that is going to increase the cost of this program in excess of $5 billion.

Can you tell us why you need twice as much testing as either the Air Force or the Army in terms of validating your missiles?

Commodore **Malley**. The only thing I can say right here, I would like to come back and answer totally for the record on that one, but we use a JCS formula in terms of confidence of assessment. Based on the size of our force, we run a certain number of tests to gain that confidence level.

It is really just a mathematical formula that we fill out to get the numbers.

Senator **Stevens**. That is different from the Air Force and Army. They are using this statistical method or technique of reviewing these requirements. I have staff here who understand all those things if I don't, but I understand the numbers.

Why did you classify them when they are not classified for either the Air Force or the Army?

Commodore **Malley**. I can't answer that right here. We have a classification guide we put out. I would have to check the rationale for it.

[The information follows:]

OT AND FOT PROGRAMS

The sizes of the Trident II Operational Test (OT) and Follow-on-Test (FOT) programs are classified because, when combined with other unclassified information, classified data such as weapon system reliability and alert rates can be inferred. Furthermore, changes to the sizes of these programs in response to emergent requirements provide insights into weapons system performance, which is itself classified.

Concerning the Navy's need to conduct more testing than the Army or Air Force, the following information is pertinent:

JCS Memo SM-344-75 has been superseded by JCS Memo SM-477-75 which provides more detailed guidance than the former document.

[Deleted.]

As to the use of alternate statistical methods to calculate flight test requirements, the Navy uses Bayesian techniques to produce weapons system performance factors during the first year of system deployment when representative flight test data is scarce to non-existent. Such data is always the subject of careful caveats as to source and validity. Our experience is, however, that only end-to-end testing of the weapons system in its operating environment, including actual missile launch and flight, can produce reliable, representative performance factors. Some examples of Navy experience include:

The profile of system reliability versus time since initial deployment is completely different for the Polaris (AS), Poseidon (C3) and Trident I (C4) systems. An a priori assumption that a later system would reflect the performance of an earlier one would be wrong.

Non-flight test results for the Poseidon (C3) system predicted a much higher reliability than was demonstrated by early flight testing. Failure modes found in flight testing were not predicted by non-flight testing. Corrective action to restore system performance could only be validated by flight testing.

More recently, Trident I (C4) first stage motor anomalies were not predicted by non-flight testing and were only found, quantified, corrected and validated by flight testing.

TESTING ON MX AND PERSHING

Senator **STEVENS**. We don't know why they are classified. They are classified on a confidential basis and we respect the classification in this committee, although we don't like it.

It does seem to me that we need to have some greater details on why you have a program requirement that is twice that of MX and Pershing, and many people in this committee criticize the level of testing on both of those programs.

I don't think they really have realized yet how much is involved in yours. But we would like more than just an explanation for the record; we want to know why you classified them in the first place, why you are not living up to the JCS requirement in the second place, and why you can't examine what the Air Force and Army did to reduce theirs down to a level they have.

Let me emphasize that level was finally, I believe, legislated in order to prevent it from going off the wall as far as MX is concerned.

Are you familiar with this, Mr. Secretary?

Dr. **COOPER**. No, I am not in number of test missiles. I was not aware that we had legislation that limited it.

Senator **STEVENS**. Staff tells me we didn't legislate, but we were involved.

Dr. **COOPER**. We have had a lot of questions on it over the last couple of years, Senator.

MX PRODUCTION LIMIT

Senator **Stevens**. You got into MX before I got here. I just left a meeting with the House. I understand that the production limit is down.

I just want to give you a piece of advice. I think the Department is fighting the wrong number. The authorizing committees are approving 21 of the 48. The Department is fighting that number.

MX deployment will be capped at 50 and the Department is fighting that one, too. I think you ought to be fighting the cap more than you fight the annual production rate because if the MX deployment is capped at 50, we have lost 500 reentry vehicles in terms of the negotiations in Geneva.

We have already lost 500. We lost 1,000 when it was reduced from 200 to 100. I just don't understand people who don't count in terms of vehicles when we are in a very statistically-oriented negotiation, it has been my impression, in Geneva. It will be very statistically oriented.

Dr. **Cooper**. That was my comment to Senator Rudman on why we preferred 100 over 50. That equates to 500 very accurate, prompt response warheads that we give up.

Senator **Stevens**. You came in and you protested the 21 and the 50, too. In my judgment, the handwriting is on the wall about the 21.

I think you could have had an impact on the 50 and you still might if it is addressed properly. I intend to try to do that, myself.

Dr. **Cooper**. Thank you.

FUNDING IN EXCESS OF AUTHORIZATIONS

Senator **Stevens**. I appreciate you cooperation, gentlemen. Again, I am sorry I was late.

We have this bill on the floor. I was just remarking to Senator Proxmire it is getting to the point of being so specific that we almost feel we are becoming a redundant function here as far as that bill is concerned.

I think part of it is the Department's doing. We end up with protests like we have from the two authorization committees that the Department not spend the monies we appropriated last year because they are in excess of authorization when you had a similar number of areas where appropriations were less than authorizations.

We didn't exceed the budget by definition last year. The effect of it is to bring about a second whack at the 1985 budget. Now that is what is going on out here again in terms of the limitations that are being put on this bill from the authorization point of view.

I would hope that you would take a look at that in the budget process for next year and not put in so many individual item restrictions in terms of the authorization process.

They are in effect granting your request, but you are tying your own hands behind your back. You are not going to be able to use a substantial amount of money we appropriated last year because it was much in excess of the authorization on a particular item when I say we had many items considerably below the authorization.

SUBMITTED QUESTIONS

The committee has additional questions which will be submitted at this point in the record.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

ADDITIONAL COMMITTEE QUESTIONS

M-X MISSILE PROCUREMENT/DEPLOYMENT CAP

QUESTION: Is it economically feasible for the Air Force to mass produce small, single warhead ICBMs if M-X is capped at 50? How would you integrate this into your outyear procurement schedules?

ANSWER: Yes, it is feasible to mass-produce the SICBM if MX is capped at 50. However, if the AIRS and MX-21 production lines are discontinued between MX and SICBM production, additional start-up costs will be needed. SICBM production schedules are determined by the program design, development, and test activities. The current schedule combines minimum technical risk, competition, innovation, and a 1992 IOC. Any attempt to advance the production schedule would sacrifice part of this program strategy. Therefore, outyear procurement schedules, which currently incorporate maximum economic production rates should not be impacted by the MX deployment cap.

SILO HARDENING PROGRAMS

QUESTION: Are you seriously looking at silo hardening for some of the M-X missile force? Or is this merely in the studies and analysis stage?

ANSWER: The Air Force and Defense Nuclear Agency are approximately half way through a three year hard silo development program applicable to Peacekeeper or Small ICBM. The purpose of the program is to advance the hard silo basing technology and reduce the uncertainties that existed in the early 1980s as pointed out by the Scowcroft Commission. Test results are very encouraging and the Air Force believes that silos with a balanced hardness of 20-25 times greater than Minuteman could be constructed. The joint Air Force/Defense Nuclear Agency program will be completed in FY 86 to support a Full Scale Development Decision in FY 87.

QUESTION: Could you execute a silo hardening program for the M-X by the late 1980s or early 1990s? Would it be reasonable to slow further M-X development until that time, so that they can be made more survivable?

ANSWER: The Air Force and Defense Nuclear Agency are approximately half-way through a superhard silo technology program designed to provide the data required to support an FY 87 Full Scale Development decision. A decision to initiate full scale development in FY 87 could lead to a deployment of Peacekeeper in superhard silos in the early 1990s. The production of Peacekeepers should continue at a minimum rate of 21 missiles per year to support the operational test program, avoid further stretchout and minimize excessive unit production cost growth.

ECONOMICAL HARDENING

QUESTION: It would appear to be much more economical to harden 50 M-X silos containing 500 warheads, rather than 500 silos for 500 small ICBMs.

Isn't the future of silo hardening really with the M-X missiles, if we are to do it at all?

ANSWER: In terms of direct cost for hardening missile silos for 500 warheads, it would be cheaper to construct 50 superhardened Peacekeeper silos than it would be to construct 500 superhardened Small ICBM silos. However, direct cost of the superhardened silos and the operational missile systems is not the only parameter to be considered. The cost to the Soviets to attack U.S. forces is perhaps the more important consideration. The purpose of our ICBM force is to enhance deterrence. Superhard silos could accomplish this; 500 superhard silos would cost the Soviets 10 times the resources to attack than 50 silos would. Furthermore, because each Small ICBM silo only contains one warhead; therefore, the return to the Soviets is only one-tenth of what they get for attacking the 10 warhead Peacekeeper. When all military considerations are taken into account, a mixture of Peacekeeper and Small ICBMs in various basing modes would probably provide the most survivable and effective force.

SMALL ICBM VS MX

QUESTION: How much funding would be required in FY 86 and FY 87 to redirect the silohardening technology program from the small ICBM to the M-X?

ANSWER: The current ICBM hard silo development program being conducted by the Air Force and the Defense Nuclear Agency is a three year technology validation program that is scheduled for completion at the end of FY 86. The program is structured to support basing options for either the Peacekeeper or the Small ICBM. No additional funding beyond the Air Force FY 86 request for $752.0 million is needed to support a Peacekeeper in hard-silo Full Scale Development basing decision in late 1986.

SMALL ICBM PROGRAM

QUESTION: When will you know how many Small ICBMs you need to procure? How would that decision be affected by a reduction in the M-X program?

ANSWER: Force structure and sizing studies by the Air Force are in progress. The actual number of SICBMs required is dependent on deployment mode, systems design and characteristics, Air Force levels of Peacekeeper, and future arms control agreements. Preliminary analyses indicate that SICBM force levels around 500 (assuming a 100 Peacekeeper deployment) may be adequate. The force structure requirements will be better defined prior to the full scale development decisions in late 1986. Any changes in the projected Peacekeeper program could change this requirement.

BASING MODE

QUESTION: At this point, which basing mode appears the most promising for the small ICBM in terms of lower O&S and personnel costs? In terms of survivability?

ANSWER: Preliminary studies indicate that, in terms of O&S and personnel costs, the SICBM based in superhard silos appears least costly. However, projected overall life cycle costs for SICBM in superhard silos is more costly than other options due to the high cost to construct silos with extreme hardness. Since we are still in pre-FSD, many issues are yet to be resolved relating to survivability, e.g., vehicle hardness, speed, superhard silo hardness, etc. However, in terms of survivability the hard mobile launcher (HML) concept appears to provide the potential for the highest survivability, the ability to extract the highest attack price, and the potential to counter threat growth.

MANPOWER REQUIREMENTS

QUESTION: What is the Air Force's preliminary estimate of manpower needed for operations, maintenance, security and support of a small ICBM/hard mobile force? How does this compare to silo basing, particularly the manpower requirements?

ANSWER: Preliminary estimates for manpower to support a Small ICBM/hard mobile force range from 15,000 to 20,000 personnel; preliminary estimated manpower for the hard silo basing option ranges from 3000-5000 personnel. These estimates include operations, maintenance, and security personnel to support a 500 missile force. Since the program is barely into the pre-FSD phase, these estimates are extremely preliminary and will be refined during the next two years to provide the most accurate assessment prior to entering Full Scale Development in late 1986. The Air Force is committed to deploying the most cost effective, least manpower intensive Small ICBM possible.

PUBLIC RESISTANCE

QUESTION: Will a small, mobile ICBM encounter some of the same public resistance that the mobile M-X proposal had, which ultimately drove us back to silo deployment?

ANSWER: The Small Mobile ICBM is being designed for deployment in the Hard Mobile Launcher (HML) basing mode. In terms of survivability, cost, maintainability, and operability, the hard mobile launcher concept is very promising. In peacetime, the HML can be operated entirely on existing DOD and DOE installations. It appears that no new land needs to be acquired, no new land needs to be taken out of public use, no major construction (i.e., hardened shelters) is required, and no new roads on public land are required. Because the HML will operate on government installations and roads, environmental impact should be minimal, public interface will be minimal, and security will be maximal. Therefore, the SICBM based in the HML mode should not encounter the fierce public resistance that the M-X Multiple Protection Shelters (MPS) concept met.

B-1 BOMBER

QUESTION: While the Air Force position is to close the B-1 production line after the 100th bomber, as much as $1 billion appears to be excess to current programs needs. How can we be sure the Air Force won't propose using this excess funding for additional B-1 bombers?

ANSWER: Until remaining multiyear procurement contracts are negotiated and definitized, no realistic assessment of the adequacy of program funding is possible. At that time, the Air Force will provide a "full accounting" of program costs and will identify any funds "excess" to program needs.

The Air Force fully supports the Administration's Two Bomber Program. No plans have been made nor actions taken to expand the B-1B buy beyond 100 aircraft. Air Force contracting and financial actions are consistent with Congressional restrictions which restrict the use of program funds "for any activity having as its objective research, design, demonstration, development, or procurement of more than 100 B-1B bomber aircraft."

SEPARATE ADVANCED TECHNOLOGY

QUESTION: What is the Air Force requirement for a MARV with [deleted] accuracy? Why can't you use the Navy's large accurate evader?

ANSWER: We are pursuing MARV technology as a prudent hedge against Soviet ABM upgrades that could defeat ballistic reentry vehicles (RVs) and their associated penetration aids as well as further hardening of critical targets that negate the effectiveness of purely ballistic or evader MARV systems. A requirement to deploy MARVs on ICBMs will depend on these threats materializing. In the case of increased target hardening, accuracy becomes a critical parameter. [Deleted]. This capability may be effective against current target hardness levels, but may not be adequate against the much harder target class. Our MARV technology effort investigates the critical technologies necessary to meet these Soviet threats if they are proven real. It is yet to be determined if these improved capabilities can be achieved.

COMMON MARV

QUESTION: The Air Force MARV program has a late 1990s IOC--hardly indicative of a program with urgent priority. Why can't both Services pool their resources on a common MARV and get one deployed earlier?

ANSWER: The Navy's MARV is planned to be an evader-only MARV to counter potential Soviet ABM upgrades. The Air Force is investigating ballistic reentry vehicle (BRV) penetration aids to counter the near-term ABM upgrade threat and views MARV technology as a hedge against further ABM upgrades that could defeat our BRV penetration aids. We also view MARV technology as a hedge against increased Soviet target hardening that would require accuracies beyond BRV and evader MARV capabilities. A requirement to deploy MARVs on ICBMs will depend on these future threats, [deleted.]

The Air Force and Navy have evader MARV prototype designs (i.e., AMARV, MK 500) with flight test experience that could support a full scale development start in FY 88 to achieve an early 1990s

IOC if required. Last year, a DOD study group evaluated the possibility of a common MARV program and concluded that it was feasible, but would result in a non-optimal design for each Service. The group found that the constraints that would have to be incorporated (e.g., smaller D-5 dimensional envelope, Air Force use of insensitive high explosive and terminal fix guidance system) produced a design with [deleted], [Deleted] than Service unique configurations. Because this design is significantly different from the MARVs previously tested, the program would incur additional risk and development time (more flight testing) and could be delayed until the mid-1990s.

MARK 21 VS. MARK 5

QUESTION: What is the requirement for the Air Force and Navy having separate reentry vehicle programs (Air Force Mark 21; Navy Mark 5)?

ANSWER: DoD, in conjunction with the Department of Energy, jointly examined the use of a large variety of reentry bodies for the TRIDENT II D-5 program. The Air Force MK-21 was one of the reentry bodies examined. As a result of this Joint DoD/DOE TRIDENT II Reentry Body Warhead Study, the MK-5 reentry body was selected for development and use on the TRIDENT II (D-5) missile. On 30 December 1982, the Deputy Secretary of Defense advised the Secretary of the Navy of his decision to pursue the new MK-5 warhead/reentry body combination. The MK-21 was not selected for a number of technical reasons: it was heavier than the MK-5; it was larger than the MK-5 (which was a very critical parameter, since the available volume in the TRIDENT SSBN launch tube was fixed); the size of the MK-21 limited the payload to fewer reentry vehicles than the MK-5; the MK-21 would require some redesign to be compatible with the submarine environments (pressure) and the full range of reentry conditions unique to the SSBN operating areas; and with the reduced MK-21 payload capability the SSBN total force hard target kill mission would have a reduced effectiveness using the MK-21 vice the MK-5. Because the PEACEKEEPER missile with the MK-21 reentry body will reach IOC three years ahead of the D-5/MK-5, it is impractical to utilize the MK-5 on PEACEKEEPER. An additional benefit derived from independent development of components of the three systems which make up the strategic TRIAD is that they are less vulnerable to any single countermeasure the Soviets might employ.

SEPARATE ADVANCED TECHNOLOGY

QUESTION: What is the requirement for the Air Force and Navy having separate reentry vehicle programs (Air Force Mark 21; Navy Mark 5)?

ANSWER: There is no specific requirement which states the Air Force and the Navy will have separate reentry vehicle programs. The Navy, in conjunction with the Department of Energy and with the Department of Defense jointly examined the use of various reentry bodies and warheads for use in the TRIDENT II MK-5 program. The MK-21 was one of the reentry bodies examined. It was not selected because its size and weight were not compatible with the missile envelope, which is constrained by the size of the submarine. In addition the MK-21 has less yield than the MK-5 and with the projected accuracy of the TRIDENT II the effectiveness of the TRIDENT II system would be reduced by about 16 to 24% as compared to the MK-5. The warhead for the TRIDENT II is not a new design but is a variation of designs that were developed and tested by the Department of Energy in 1973 and 1982. The fuze for the MK-5 is being developed by the Sandia National Laboratory and is based on work done by the Air Force for the MK-21.

SILO HARDENING

QUESTION: Test results on scale model hard silos have shown that superhardened silos can be constructed to withstand overpressures some 20-25 times higher than today's silos. Hardening technology still needs to be validated through large-scale, full-size tests.

While superhardening technology cannot be ready in time for M-X deployment, recent progress suggests that it could be ready for a 1992 IOC for the small ICBM. The Air Force conducted full-size tests for a small ICBM-type silo on March 30 at 25,000 psi, more tests are to follow at higher hardness levels.

Is silo hardening a short-term or long-term solution to ICBM vulnerability? The SALT I Treaty prohibits new silo construction. Would we be limited to refurbishing existing ICBM silos? Is it feasible to do this?

ANSWER: Superhardening is one of several options under consideration by the United States as a long-term solution to the ICBM vulnerability issue. Although the U.S. Interim Restraint policy encompasses both the SALT I Interim Agreement and SALT II Treaty prohibition on new ICBM silo construction and internal volume growth limits, modernization of existing ICBM silo launchers is allowed. Modification of existing Minuteman silos to enhance hardness could be accomplished within the SALT II limits.

SUPPORT COSTS

QUESTION: In terms of personnel and operations and support costs, how much cheaper would hard silo basing be over hard mobile basing?

ANSWER: Very preliminary estimates indicate that Hard Silo Basing for the Small ICBM has slightly higher projected life cycle cost than hard mobile launcher basing. However, the preliminary estimated manpower is 3000- 4000 for Hard Silo, (as compared to 15,000-20,000 estimated for Hard Mobile Launcher) and the preliminary operating and support costs for the Hard Silo program for the Small ICBM is $8 billion (FY 82$/500 missile force) as compared to $13 billion (FY 82$/500 missile force) for the Hard Mobile Launcher basing program. The Air

Force is continuing to seek methods of reducing these projected costs through streamlined, innovative operational concepts and technology.

DELETION OF FUNDING FOR SILO HARDENING

QUESTION: The House Armed Services Committee recommended deletion of all $152.2 million for silo hardening. Would deletion of funding for silo hardening eliminate it as a competitor for small ICBM basing? Or would the Air Force continue to pursue the silo hardening technology for possible later application to small ICBM or M-X basing?

ANSWER: The deletion of all funds, $152.2 million, from the Hard Silo ICBM Follow-on basing technology program terminates a promising technology effort one year before scheduled completion and before all test data is available to validate the technology. The impact would be to foreclose the promising, hard silo basing alternative for the second 50 Peacekeeper missiles or Small ICBM and prematurely select the hard mobile basing mode for the Small ICBM before important technical and political issues have been resolved.

DEEP BASING

QUESTION: You are requesting $20 million for R&D on deep basing. Deep basing was not mentioned in the President's report as a potential basing mode for M-X, but it has been mentioned as a possible long-term option for a secure reserve ICBM force, underground command posts and even satellite reconstitution.

Deep basing appears to be a technology in search of a mission. Just what is the Air Force commitment to it, and how would you propose to use it ten or fifteen years from now?

ANSWER: The Air Force is committed to a balanced research and development program for deep basing of intercontinental ballistic missiles (ICBMs) as described in the January 1985 ICBM Deep Underground Development Program to the Senate Appropriations Committee. The primary objectives of this program are to reduce development lead time and bound cost/schedule/technical risks to support a late 1990s option for deep underground basing of a secure reserve force of ICBMs.

Whereas ICBM deep underground basing is a research and development effort that is designed to provide options for the late 1990s, Peacekeeper is an immediate strategic necessity. The President's March 1985 Report on Peacekeeper Acquisition thus addressed only those Peacekeeper basing modes that could meet the current deployment requirements.

MINUTEMAN SQUADRONS

QUESTION: The Minuteman missile squadrons R&D budget request increases from $4.7 million to $31.2 million to support software development for Minuteman test equipment and program planning for the Minuteman III penetration aids program. Minuteman III penetration aids full scale development is scheduled to begin in FY 1987.

You show a Minuteman III penetration aids IOC of 1991 and an FOC of 1995, but the total development and acquisition cost for deploying penetration aids on the Minuteman III force is not identified. Furthermore you do not state if the penetration aids deployment will be for all Minuteman III missiles or only those armed with the Mark 12A reentry vehicle. Please outline your plans for deployment of penetration aids on the Minuteman III force. Will these penetration aids be essentially the same systems to be flight tested on the Peacekeeper ICBM next year?

ANSWER: The Minuteman III penetration aids program will develop, test, and procure penetration aids systems. The decision on the number of systems to be procured will be made several years from now and will be based upon our best estimate of the Soviet ABM threat at that time. These penetration aid systems will include the deployment modules, passive decoys, new lightweight chaff, and new software programs required to use the systems. An ongoing study is evaluating whether the reentry vehicle decoy should be tailored to the Mark 12, Mark 12A, or both reentry vehicles. Total program development and acquisition cost has not yet been determined--the program is still in advanced development in the Advanced Strategic Missile Systems program and will not enter full scale development for two more years. IOC will be FY 1991 and FOC will be FY 1992. The penetration aid components (passive decoys and advanced chaff) will be essentially the same as those to be flight tested on Peacekeeper next year.

WORLDWIDE AIRBORNE COMMAND POST REPLACEMENT

QUESTION: You are requesting $2.4 million in FY 1986 to study and make initial plans for a Worldwide Airborne Command Post replacement program for current EC-135s. The staff has been informed that candidate aircraft include the Navy E-6 (a 707), an extended range Boeing 747, and the C-17.
What is your requirement to replace the entire EC-135 fleet for the Strategic Air Command and all theater CINCs?

ANSWER: The primary requirement is to improve the survivability of the command post aircraft. The Joint Chiefs of Staff validated a Justification for Major System New Start. This document describes the [deleted] and provides requirements for the replacement system. These requirements identify [deleted] [deleted.] The document only justifies replacement of the 27 authorized command post aircraft.

COMMAND CENTER ARCHITECTURE STUDIES

QUESTION: When will you have some answers back to your concept and command center architecture studies?

ANSWER: We anticipate completion of the concept and tradeoff studies concerning command center architecture and the WWABNCP system by Jan 1986.

B-1B

QUESTION: The Air Force has informed the Committee that it will incorporate a Stall Inhibitor System (SIS) into the

B-1B strategic bomber. This modification enables safe maneuvering up to the limit of the B-1B's angle of attack.

Testing of the SIS will begin this summer.

Why was the stall inhibitor system (SIS) incorporated into the B-1B? What, if any, will be the cost impact of this change to the B-1B program?

ANSWER: The Stall Inhibitor System (SIS) is a change to the aircraft's Stability and Control Augmentation System (SCAS). It was incorporated to enable safe maneuvering at higher angles of attack. The program office approved incorporation of a SIS when the B-1B flight test program began in 1983. The cost of this design change to the SCAS will be funded with engineering change order monies which are included in the B-1B's $20.5 billion cost ceiling. The estimated cost impact is $3 million for full scale engineering development and $7 million for production.

STABILITY AND CONTROL AUGMENTATION SYSTEM

QUESTION: What was the problem with the current SCAS (Stability and Control Augmentation System)? If the SCAS was not modified with the SIS, what would be the impact on B-1B mission planning (i.e., maximum altitude, gross weight and G loadings)?

ANSWER: While little high angle of attack (AOA) testing was accomplished in the original B-1A test program, flight tests had indicated reduced longitudinal stability as the AOA limit was approached. Because of the potential for uncommanded pitch-up while maneuvering at high AOA, the B-1B program office approved the incorporation of a Stall Inhibitor System (SIS) in 1983. The SIS modification, similar to the stall warning system on the F-111, allows safe maneuvering right up to the AOA limit.

Without the SIS, the pilot would have to rely on a stick shaker warning system set to operate at 80 percent of the AOA limit. Because the range of safe, usable AOA would therefore be smaller, the aircraft would be constrained to a lower gross weight at a given altitude and load factor. These constraints would have to be addressed in the planning of mission profiles. The SIS modification, by significantly increasing the aircraft's AOA envelope, provides an improved capability which allows SAC mission planners greater flexibility.

FLIGHT TESTING

QUESTION: Will all flight testing of the stall inhibitor system be validated and completed prior to delivery of IOC of the first B-1B squadron? Which aircraft will have to be retrofitted with the SIS? What is the cost of the retrofit?

ANSWER: B-1B number 1 is now flying with the Stall Inhibitor System (SIS) installed. The SIS design will be validated by March 1986, well before IOC which is planned for September 1986. B-1B number 9 and subsequent aircraft will be delivered with an operational SIS installed. Incorporation of SIS on these aircraft will be funded with engineering change order monies included within the $20.5 billion ceiling. B-1Bs number 2 through 8 will be delivered without SIS installed and will be retrofitted. The cost of this retrofit effort is currently being definitized.

SMALL ICBM/HARD ROAD MOBILE FORCE

QUESTION: What is the Air Force's preliminary estimate of life cycle costs for a small ICBM/hard road mobile force (please separate into acquisition and O&S categories)? What assumptions were made concerning numbers of deployed missiles, numbers of surviving missiles, mobile launcher hardness, mobile launcher size and speed, land required during peacetime and land required to achieve desired survivability?

ANSWER: An Air Force preliminary life cycle cost estimate for a hard mobile SICBM system is $44 billion (FY 82 $). This estimate includes $31 billion for acquisition and $13 billion for 12 1/2 years of O&S. This cost estimate assumes:

500 deployed SICBMs

Prelaunched survivability > 50 percent. The greater the dispersal time the greater the survivability.

Hard mobile launcher: Weight - about 160,000 lbs.; speed - 50 mph on road; 15 mph off road

Land required during peacetime - 4000 square miles of DOD/DOE land used in such a way as to avoid mission conflicts with current users.

On strategic warning this area can be expanded to 8,000 square miles.

On tactical warning area generated could be 28,000 square miles or more.

Since the program is barely into the pre-FSD phase, these costs are very preliminary. The Air Force is committed to developing the most cost-effective SICBM program.

LIFE CYCLE COSTS SMALL ICBM/HARD SILO FORCE

QUESTION: What is the Air Force's preliminary estimate of life cycle costs for a small ICBM/hard silo force (please separate into acquisition and O&S categories)? What assumptions were made concerning numbers of deployed missiles, numbers of surviving missiles, and silo hardness?

ANSWER: (D.) The Air Force preliminary cost estimate for a Hard silo system is $49 billion (FY 82$). This estimate includes $41 billion for acquisition and $8 billion for 12 1/2 years of O&S. This cost estimate assumes:

- 500 deployed SICBMs
- (Deleted)
- Percentage of survivability would be dependent on the validated threat for the 1990s and the allocation of this threat over the entire Triad. At the present time, no specific survivability has been calculated. It must be emphasized that the Small ICBM is barely into the pre-Full Scale Development phase and therefore, these costs are preliminary. The Air Force is continuing to reduce all costs through technology development programs and innovative operational concepts.

MANPOWER REQUIREMENTS

QUESTION: What is the Air Force's preliminary estimate of manpower needed for operations, maintenance, security, and support of a small ICBM/hard road mobile force?

ANSWER: Preliminary estimates for manpower to support a Small ICBM/hard road mobile force range from 15,000 to 20,000 personnel. These estimates include operations, maintenance, and security personnel to support a 500 missile force deployed in hard mobile launchers. Since the program is barely into the pre-FSD phase, these estimates are extremely preliminary and will be refined during the next two years to provide the most accurate assessment prior to entering Full Scale Development in late 1986. The Air Force is committed to deploying the most cost effective, least manpower intensive Small ICBM possible.

ENVIRONMENTAL IMPACT ASSESSMENT

QUESTION: Considering the many reasons that have precluded the use of military lands in Nevada, California, and Arizona for deployment of the Peacekeeper (M-X) missile, what new information leads the Air Force to believe military lands in those states will be available for deployment of the small ICBM in either hard mobile launchers or hard silos?

ANSWER: Previous deployment concepts (i.e., Peacekeeper) required specific geophysical conditions not found on the DOD lands. SICBM may not require the same conditions. Until a specific deployment concept for the Small ICBM is selected, it is impossible to predict which military lands in the United States are fully suitable. Based on the preliminary concept definitions for the deployment modes of the Small ICBM, considerations of all military lands in these states cannot be ruled out.

BASING CONCEPTS

QUESTION: Considering the numerous basing concepts that have been studied for the small ICBM, why has the Air Force focused on two (hard road mobile and hard silos) and prefers hard road mobile? Please explain.

ANSWER: Several basing mode options are under consideration for the SICBM including HML, hard silo, soft road mobile, and deep underground. The current Air Force program is emphasizing hard road mobile and superhard silos for two reasons. First, the soft road mobile has been extensively studied in the past and is well understood. Second, because of cost, survivability, public interface, deterrent value, and environmental issues, hard road mobile and superhard silos appear to be the most promising concepts -- yet they are the least understood, hence the bulk of current efforts are directed to these programs.

ICBM MODERNIZATION

QUESTION: The Congress authorized production of 21 missiles for fiscal year 1985, and, assuming funds are released this spring, an additional 21 Peacekeeper missiles will be approved for production. How many missiles would be needed for testing over their life cycle if production were stopped at 21

BEST COP

or 42 missiles? Would the Air Force still buy 108 missiles for operational testing?

ANSWER: The size of the operational test program is statistically derived to meet the Joint Chiefs of Staff requirements and is independent of the number of missiles deployed. Therefore, 108 operational test missiles are needed to maintain confidence in missile performance and reliability over the 15 year system life and to support development of planning factors for Single Integrated Operations Plan.

COST IMPACT OF TERMINATING

QUESTION: What would be the cost impact of terminating the Peacekeeper program at 21 or 42 missiles?

ANSWER: Since the production buys are fully funded, termination costs would not be applicable. Continuation of the R&D program and deployment of all missiles procured in FY 84 and 85 would require FY 86 funding in the amount of $1730 million (R&D-$784 M; Procurement-$890M, Milcon-$56 M). This does not include funding required to modify the launch control system for a mixed Peacekeeper and Minuteman force in a single squadron or the costs to restart the production capability at a later time to procure the 123 test missiles which are required to meet JCS confidence requirements over the life of the system.

IMPACT ON SMALL ICBM PROGRAM

QUESTION: A critical assumption used for small ICBM program planning is the deployment of 100 Peacekeeper missiles (1000 warheads). If the Peacekeeper force is terminated at 42 or less missiles, what would be the impact on the ICBM program? For example, would additional small missiles have to be procured?

ANSWER: The Air Force has no plans to terminate the Peacekeeper force at less than 100 deployed missiles. All operational planning is predicated on the 100 missile Peacekeeper deployment. Should the Peacekeeper deployment be adjusted, such an adjustment would have to be evaluated within the spectrum of the entire Triad, target requirements recomputed, and missions reassigned to cover all requirements. The impact on the number of Small ICBMs to be procured is not known at this time.

FORCE MIX

QUESTION: Has the DoD decided upon an appropriate force mix of land-based ICBMS--Minuteman II, Minuteman III, Peacekeeper (MX), and small ICBMs? What is the mission role of each weapons?

ANSWER: Our future ICBM force structure is heavily dependent on deployment of 100 PEACEKEEPER missiles. Deployment of any less will force us to place additional reliance on our older MINUTEMAN systems and the yet unproven Small ICBM. The primary role of all our ICBMs is to provide prompt retaliatory capability against time urgent targets. We currently have a critical shortfall in capability to attack hardened, time urgent targets, with a portion of the MINUTEMAN III force providing the only credible threat. Without a full deployment of 100 PEACEKEEPERs, we will be forced to rely on less effective weapons to target the Soviets' hardened [deleted.]

SMALL ICBM SURVIVABILITY

QUESTION: It's potential survivability is a major advantage of the small ICBM program. How many small ICBMs are required to survive after being attacked? If the required level of survivability remains to be specified, please explain.

ANSWER: The number of Small ICBMs (SICBMs) required to survive has not been established yet. The number of Small ICBMs which would survive a Soviet attack is dependent on how the Small ICBM is deployed, how many are deployed, how the Soviets might allocate their total available throwweight to the Small ICBM force, what is the "Price to Attack" individual or combined elements of the U.S. Triad, and on possible Soviet specific desires to neutralize certain elements of the U.S. Triad force. A purpose of the SICBM force is to make that price as high as possible and if feasible make it so high that the Soviets cannot pay it or will not pay it. Force structure analysis is underway to determine appropriate force levels. Results will be available by Full Scale Development in late 1986.

SMALL ICBM COST DRIVERS

QUESTION: Indications are that the small ICBM program will be very costly and could, in fact, be unaffordable, depending upon the quantity of missiles needed. What are the major cost drivers in this program and has the Congress been made aware that affordability is a concern?

ANSWER: The findings of the President's Commission on Strategic Forces (Scowcroft Commission) were endorsed by the Congress after being published in April 1983. One of the strongest reasons for deployment of a small, single-warhead, mobile ICBM is its contribution to long-term strategic stability. The President's Commission while stating this attribute, acknowledged that it was not without its costs. "Spreading a given number of ICBM warheads, whatever the number, over greater numbers of ICBM launchers would normally mean added operating costs...but permitting our forces to evolve in this direction and encouraging the Soviets to do likewise is worth such costs." The major cost drivers in this program, as in past ICBM programs, will be acquisition of the guidance system and the cost of a (mobile) highly survivable basing mode. Until more information is extracted from our pre-full scale development program, the Air Force can only provide very preliminary estimates of costs for this program.

SINGLE SHOT PROBABILITY OF DAMAGE

QUESTION: Has a single shot probability of damage been established for the Small ICBM? What is the hardness of targets used in calculating the damage capability? What is the rationale for that requirement?

ANSWER: Based on the Scowcroft Commission report, Schriever Group recommendation, and SAC needs, the missile must have a hard target kill capability comparable to Peacekeeper. The engineering requirement is that it should be capable of single shot PD of (d) on (d) percent of Soviet hard targets with a goal of (d) PD (from maximum range and any basing mode). The PD should be achievable against the estimated hardness of (d) psi (range of uncertainty — [deleted] psi) which is the nominal hardness of most of the hardest targets within the Soviet Union.

Rationale: A primary role for the SICBM will be to provide a post attack power base for the United States. To do this it must be capable of striking the full spectrum of Soviet targets — including very hard targets. Key to the United States in a Post attack period will be the ability to hold hardened command and control, and leadership targets at risk. We must be able to deny the Soviet leaders the capability to carry on a prolonged war from sanctuary of hardened facilities. We also must be able to deny the Soviets the use of any remaining ICBMs in silos and take away any silo reload capability. This will strengthen deterrence since the SICBM will be capable of denying those assets that would be necessary for the Soviets to conduct and survive a nuclear war. Since United States' post SIOP nuclear assets may be few, it is essential that each surviving SICBM be highly capable.

REQUIRED SINGLE SHOT PROBABILITY OF DAMAGE

QUESTION: What is the required single shot probability of damage for the small ICBM versus the Peacekeeper? Explain any difference either in the required capability or the target hardness used in calculating the capability.

ANSWER: (D.)The original Peacekeeper requirement was a [deleted] probability of damage (Pd) against a (d) target, with a goal of (d against a (d) target. The Small ICBM is required to achieve a (d) against a (d) target, which is currently the maximum nominal assessed hardness for all but a few of the hardest Soviet targets. A (d) against this level of hardness allows most Soviet targets to be attacked with a single weapon, thereby maximizing weapon efficiency.

The difference in design requirements reflects technological advances (principally in the areas of guidance and reentry subsystems) which have been made since the Peacekeeper program began and which are now being applied to Small ICBM development. The requirements are defined differently (in terms of target hardness) because of Intelligence Community reassessments of Soviet silo hardness since the original Peacekeeper requirement was specified. Silo hardness estimates have been refined and generally increased as additional data have become available.

(D.) Peacekeeper system design objectives have been continually reevaluated in the context of these hardness reassessments to ensure the weapon system will provide the necessary capability. The Peacekeeper development program has exceeded the original design requirement, (deleted) target.

REQUIRED ENDURANCE

QUESTION: What is the required endurance of the small ICBM weapon system? What is the rationale for that requirement? Will any of the basing concepts currently being actively pursued provide the required endurance? If not, please explain.

ANSWER: When designing a weapon system we would like to make it as flexible in capability as possible subject to cost and technological constraints. This is true for the SICBM. Because of its projected high survivability, it is an outstanding choice for a secure reserve role. Furthermore, as a single RV system, it may be a better post attack weapon than a MIRVed System (e.g., D-5) because of the uncertain nature of the post attack target base. These considerations suggest that the SICBM should be designed with a great deal of endurance to be able to provide a substantial power base for the post war United States. Precisely how long this endurance should be is debatable, but it seems to be reasonable to try to maximize the endurance of the surviving SICBM force subject to cost constraints — with a goal of up to a year. This may require a dormant operational mode and the stockpiling of critical supplies and machinery at secure locations. All basing modes being considered are being evaluated to insure that they can be developed to provide the required endurance.

BASING CONCEPTS

QUESTION: What is the required range for the small ICBM? What is the rationale for that requirement? Is the small ICBM range requirement similar to the Peacekeeper requirement? If so, please explain why both weapons must have the same range?

ANSWER: [Deleted].

Rationale: The SICBM is being designed and developed to be a survivable, enduring retaliatory force that can provide a strong, flexible power base in the post SIOP period. To be able to do this it must have the capability to hold at risk all potential targets of value to the Soviets. A range limited SICBM can create sanctuaries in the Soviet Union that can be exploited by the Soviets in their recovery or efforts to continue the war. [Deleted].

SMALL ICBM WEIGHT LIMIT

QUESTION: Has the Congressionally imposed small ICBM weight limit of 33,000 pounds made missile development more

BEST

difficult and risky? If so, please explain.

ANSWER: The 33,000 pound limit presents a challenging systems engineering effort, but one which has reasonably high confidence of success. The Air Force has established a goal of developing a Small ICBM which weighs 30,000 pounds or less. This weight goal requires development of advanced, lightweight, and more accurate guidance and control systems; lighter and higher strength motor cases; lighter, thinner, and stronger motor insulation material; advanced, lightweight ordnance systems; and more energetic propellants. It will require the Air Force to conduct a very aggressive, fast-paced full scale engineering development program to develop and deploy the 30,000 pound Small ICBM in December 1992.

INCREASED WEIGHT ALLOWANCE

QUESTION: Could a small ICBM system with hard mobile launchers be developed sooner, at less risk, and at less cost if the missile were allowed to weigh more than the Congressionally imposed limit of 33,000 pounds? Please explain. If no such analysis has been done, please explain.

ANSWER: The pacing element of the Small ICBM Hard Mobile weapon system is not the missile per se but the time required to define, develop, test and produce the hardened mobile launcher vehicles while simultaneously integrating the missile. The Small ICBM (in Hard Mobile Launchers/Hard Silos) deployment date is predicated on developing the missile and the basing mode, then integrating the two; increasing the weight would not shorten the deployment date for the Small ICBM in its basing mode.

PENETRATION AIDS

QUESTION: Would a 33,000 pound missile have the capability to use penetration aids without degrading range or payload capability? If not, please explain.

ANSWER: The addition of penetration aids and their associated weight to the baseline SICBM could degrade the missile's range/payload capabilities. The baseline SICBM requirement provides for a 1,000 pound payload to include a modified Advanced Inertial Reference Sphere (AIRS), a MK-21 reentry vehicle, and the location and volume for future penetration aids deployment. Options which could be pursued to add penetration aids to the baseline Small ICBM include: (1) additional weight reduction efforts in the Guidance and Control system, (2) decreasing the range of any Small ICBM carrying penetration aids (and move the missiles to more northerly basing), or (3) increasing the 30,000 pound missile within the 33,000 pound mandated to accommodate additional penaids and additional propulsion to deliver them the required range. However, as the Scowcroft Commission report indicated, no one system or concept can or should be expected to do everything required of the ICBM force. Peacekeeper has sufficient throwweight to accommodate penaids should there be a mission requiring them. It is not clear that the post attack mission of the SICBM dictates penetration aids as a hard requirement.

MOST DIFFICULT TECHNOLOGICAL CHALLENGES

QUESTION: What are the most difficult technological challenges involved with development of the small ICBM? Categorize the risk of each challenge as low, moderate or high and explain the rationale for the risk assignment.

ANSWER: Challenges relative to the Small ICBM (missile only) specifically, and not the total weapon system, are:

(1) The guidance and control subsystems, especially when the missile is deployed in a mobile mode. Moderate risk because the baseline G&C is the same as is being used on Peacekeeper. We are attempting to reduce this risk by developing parallel G&C systems to compete against the baseline.

(2) Propulsion system development to reduce weight and improve efficiencies. Moderate risk because technologies have been validated in advanced development testing, and still require additional validation during the pre-Full Scale Development program.

TECHNOLOGICAL CHALLENGES OF THE HARD MOBILE LAUNCHER

QUESTION: What are the most difficult technological challenges associated with development of the hard mobile launchers? Categorize the risk of each challenge as low, moderate, or high and explain the rationale for the risk assignment.

ANSWER: The most difficult technological challenges associated with the Hard Mobile Launcher are:

a. Hard Mobile Launcher (HML) resistance to nuclear blast and shock effects. Moderate risk because the real nuclear effects require further definition and evaluation, and then engineering designs must be developed to permit survivable HMLs in this projected environment.

b. Hard Mobile Launcher resistance to nuclear radiation effects. Moderate risk because electronic parts must be hardened to the same level as the missile components and the structure of the HML will provide little shielding due to its transparency to high-energy nuclear radiation.

c. Hard Mobile Launcher Physical Security Subsystem. Moderate risk to achieve a balanced accommodation of cost versus security protection versus HML mobile performance.

TECHNOLOGICAL CHALLENGES OF HARD SILOS

QUESTION: What are the most difficult technological challenges associated with development of hard silos? Categorize the risk of each challenge as low, moderate, or high and explain the rationale for the risk assignment.

ANSWER: The major technological challenges and their relative risk appear to be as follows:

a. Structural hardness is currently assessed as low risk based upon the impressive progress of the testing to date. The questions related to scaling results to full size should be resolved over the next several months, and designs for enhanced levels of structural hardness are beginning test.

b. Mechanical hardness is currently assessed as moderate risk principally for two reasons. First, additional results of cratering and related effects analysis and testing is required to better define silo motion. Secondly, our mechanical components analysis and testing is proceeding more slowly than structural testing and the loading is difficult to simulate. However, mechanical hardness is not considered to provide additional rattle space at higher cost.

c. Electrical hardness is assessed as a moderate risk because some questions remain to be resolved on response to Source Region Electromagnetic Pulse, survival of cable penetrations to silo motion and its interaction with the soil, and the development of suitable electrical surge arrestors.

SUPERHARDENING U.S. SILOS

QUESTION: Is superhardening U.S. silos a viable basing option considering evolving maneuvering reentry vehicle technology? Please explain.

ANSWER: The impact of possible future Soviet MaRV technology on the viability of possible future superhard silo basing depends on factors that are not well defined or are difficult to predict. In the next decade, it is not clear whether the Soviets could build a MaRV that would be significantly more effective than contemporary ballistic reentry vehicles (BRVs). MaRVs would be heavier and have smaller yields than BRVs. This means that each Soviet booster could carry fewer MaRVs than BRVs. Thus, a booster carrying fewer, more accurate MaRVs may be no more effective than one carrying more, larger yield BRVs. MaRVs would also have other complications. They are inherently more complex than BRVs. This complexity would create reliability problems that may negate any potential lethality improvements. Moreover, the weapon's specialized employment would remove it from use in other targeting roles, further restricting and complicating Soviet attack planning.

In summary, if Soviet MaRVs are considered in isolation and in the abstract, they appear to create a greater threat to superhardened silos than would exist in their absence. If, however, realistic operational factors are also considered, it is not clear what effect possible future Soviet MaRV technology would have in the viability of possible future U.S. superhardened silo basing.

HARD MOBILE LAUNCHERS

QUESTION: a. In the absence of limits on ICBM reentry vehicles, is hard mobile launchers a viable basing option? b. Can the Soviets effectively neutralize the system by deploying more reentry vehicles? Please explain.

ANSWER: Yes, the hard mobile launcher (HML) is a viable basing option even in the absence of limits on ICBM reentry vehicles. There are two ways that the Soviets could increase the number of ICBM reentry vehiclee. First, for a fixed throwweight they could fractionate into larger numbers of reentry vehicles. However, lethal area generation for a given throwweight does not appreciably vary with the fractionation of the throwweight. Since the mobile ICBM derives its survivability from area generation, its survivability is relatively insensitive to how the Soviets fractionate a fixed amount of throwweight. Therefore, for fixed throwweight a larger number of small RVs would not increase the threat to SICBM. Second, they could increase the deployed throwweight by either deploying more ICBMs or replacing existing missiles with larger ones. In either case, the SICBM/HML could be deployed in larger areas, or the HMLs could be hardened more, or defended. Certainly there exists an upper bound to how much area the HML can generate to stay ahead of the Soviets — the United States is finite — but there is also a practical limit to how much the Soviets could or would be willing to devote to expand their ICBM force to counter the single RV SICBM.

PROXIMITY OF SUPERHARDENED SILOS

QUESTION: Could superhardened silos be constructed near existing Minuteman support bases? If additional land is necessary, would private land need to be acquired?

ANSWER: Superhard silo basing technology is being examined by the Air Force and Defense Nuclear Agency. The three year technology development program designed to provide the data needed for a full scale development decision in FY 87 is about one-half complete. A part of the program is to examine potential basing concepts and siting locations. Superhard silos could potentially be constructed on the centerlines of existing Minuteman silos; however, hardness would be constrained to existing geological conditions. No additional land acquisition would be required, only temporary land easements would be needed for construction. Should ideal geological conditions be desired to maximize silo hardness, private or government lands would be required.

LAND ACQUISITION STRATEGY

QUESTION: Briefly describe the acquisition strategy and identify the critical milestones associated with obtaining land for small ICBM deployment in either hard mobile launchers or in hard silos. Categorize the risk in meeting milestones as low, moderate, or high and explain the rationale for the risk assignment. Also describe any special actions that the Air Force feels will be required by the Congress or the Adminstration to assure timely availability of land.

ANSWER: While the Air Force will be attempting to site the Small ICBM entirely on Department of Defense and Department of Energy land, it is possible that additional public and private lands may be needed. The December 1992 deadline for initial deployment (IOC) requires cognizance of the following estimated leadtimes:

Activity	Time Required	Starting Deadline
IOC		Dec 92
Assembly & Checkout	12 months	Dec 91
Construction	30 months	Jun 89
Land Acquisition (Private)	24 months	Jun 87
(Public)	30 months	Jan 87

For land to be acquired, it must first be selected. And prior to it being selected, the National Environmental Policy Act (NEPA) requires that Environmental Impact Statements (EIS) be prepared on all candidate locations. For a project of this size and scope, two years would normally be required to produce an administrative EIS. In turn, for environmental studies to be initiated, candidate locations must be identified. The risk of such acquisitions are presently considered moderate. Actual risks will not be known until later this year following the completion of studies intended to determine the amount of DOD and DOE land that will be available.

The Air Force is presently using preliminary design and operational criteria to screen potential deployment areas. Areas not excluded will form the basis upon which environmental studies will be performed. The procedures associated with a legislative EIS (LEIS) will be followed, in accordance with the direction provided in the 26 Sep 84 Conference Report to the FY85 Defense Authorization Act. To assure that land will be available when needed, it would be helpful for Congress to include similar statutory directives within the FY 86 Defense Authorization Act.

THREATS OF JAMMING AND SURVEILLANCE

QUESTION: Are the military installations being considered for small ICBM deployment in hard mobile launchers sufficiently distant from the coast and from national borders to negate threats of jamming and surveillance?

ANSWER: To provide for maximum operational deployment flexibility, the small ICBM is being designed to negate jamming and surveillance threats from a systems design approach. Using this approach, distance from jamming and surveillance threats will not be a limiting factor for the small ICBM. The small ICBM will be inherently resistant to jamming and surveillance.

REPLACEMENT EQUIPMENT--BALLISTIC MISSILES

QUESTION: For the FY84, FY85, FY86, and FY87 programs, specify what items and equipment are being or will be bought with their respective costs.

ANSWER: The attached chart portrays the items procured or to be procured for FY84 through FY87 under the Ballistic Missile Replacement Equipment line. It also shows the costs associated with these items. The majority of this line is associated with the Minuteman missile with a minor amount allocated to the Titan missile. The Minuteman is an essential weapon system which must be maintained at a high level of operational readiness through effective logistics support. To achieve this objective for support equipment, changes in identified requirements are given priority consideration within approved funding. Additional BP22 funding has been applied to Minuteman in FY84 and 85 to recognize the need to support a prior year unfunded carry forward and, therefore, more accurately reflect the total requirement.

REPLACEMENT EQUIPMENT - BALLISTIC MISSILES
FY84-FY87
($ IN MILLIONS)

NOUN	FY84	FY85	FY86	FY87
Rivet MILE PDM Support Equipment	5.182		6.600	7.800
G6B4 Gyro Test Station "F"	9.000		1.284	
[illegible]vark Items	8.632			
P92 (MM II & III) Test Set	6.900			
Hyd Power Supply/Field & Bleed T/S	5.800			
MATS-O-ATS-E35 (HP9500)	3.700	7.265	6.900	
Select 800 System	3.391			
IPD Modem Processor Sys	2.079			
Exciter, Vibration	1.143			
Little Mountain	.007	2.630		
Sp Test Equip (ARSIP)	.524			
Cartridge Tape Unit	.519			
TE Tractor & Trailer		28.531	1.800	52.000
Explosive Circuitry Test Set		11.200	2.800	2.800
Instr Test Set WFR		10.751	2.000	2.000
Code Inserter aVerifier Enc		6.500		
Transponder Test Set C. Band		6.128	1.000	1.000
Test Launch Support System (VAFB)		5.000	6.143	6.000
Hardness Surv Control System		3.350		
Command Destruct Test Set		3.084	.800	.800
MATS-O ITA'S & TPS		1.300	1.100	13.193
EMDAS (HETF)		1.117	1.449	.804
Elevator Work Cage Assy			.787	
Electrical Power T/S			.795	.836
1800 Series Computer & Per EQ			20.073	5.770
Mag Tape Rec/Repr			4.850	2.500
WSC Test Set			4.220	2.600
Air Conditioner, Missile Transporter			4.000	
MM Auto Data Analysis & Reduction Sys			2.000	1.000
Electromag Suscep Test Sys (LTLMTN)			.700	
Shielded Enclosure			1.600	
MM Hardness Struct Data ACQ Sys			1.100	
Payload Transporters				18.533
Air Cond Portable				8.000
Radio Set GroupUHF (HETF)				3.000
Truck/Tractor-Msl Transporter				1.800
MM Hrdns Surv Test Control Sys				1.100
D37C/D37D MM Cmptr Test Console (LTLMTN)				.700
Minor Items (Minuteman)	.388	2.092	14.463	1.376
Titan (Minor Items for Phasedown)	2.241		1.024	

STRATEGIC CONVENTIONAL/STANDOFF CAPABILITY

QUESTION: Will the SCSC program enable us to improve the B-52 weapons system in a way which obtains maximum capability at the lowest possible cost? Or is this program merely being proposed to provide a technology base from which to transfer this technology to the B-1B after the ATB comes into the force?

ANSWER: The major goal of SCSC is to provide the dedicated B-52G conventional force with the capability to employ a family of standoff weapons worldwide against land and maritime targets. SCSC provides for full weapon integration through the Integrated Conventional Stores Management System (ICSMS) which implements MIL-STD-1760 and modernizes existing B-52 Offensive Avionics Software to decrease standoff weapon integration costs.

SCSC also pursues development of improved targeting sensors. It funds development of the Special Access Required HAVE DARK technologies and a High Resolution Radar (HRR). The HRR is a multi-mode radar employing synthetic aperture/inverse synthetic aperture (SAR/ISAR) to provide inflight imagery for target discrimination and standoff weapon attack.

The SCSC program capitalizes on the inherent long range warfighting capabilities of the B-52 to bring conventional firepower to bear, within hours, anywhere in the world. As a major by-product, the technologies developed under SCSC will be transferable to the B-1B.

DEACTIVATION OF B-52G BOMBERS

QUESTION: Over the past two years there have been occasional press reports of an earlier deactivation of your B-52G bombers. Certainly, force structure considerations should play a major role in determining how quickly the SCSC program should be developed.

Just what are your force structure plans regarding the B-52Gs in the outyears?

ANSWER: The B-52G ALCM carriers will retire as the Advanced Technology Bomber (ATB) is deployed in the early 1990s. Non-ALCM B-52Gs will remain in a non-SIOP, conventional role through the mid-to-late 1990s.

TECHNOLOGY APPLICATION

QUESTION: If the B-52Gs are retired earlier than now anticipated, could this technology be applied to either the B-52H or B-1B force in a mannner that maximizes the R&D investment we are now being asked to fund?

ANSWER: Every effort is being made to insure maximum payback from the R&D investment in the Strategic Conventional Standoff Capability (SCSC) Program. The three projects of SCSC -- Integrated Conventional Stores Management System (ICSMS), HAVE DARK, and the High Resolution Radar (HRR) -- are all directly transferable to the B-52H. ICSMS and HAVE DARK projects are also transferable to the B-1B. Portions of the High Resolution Radar technology will be transferable to B-1B. The B-1B APG-164 radar already has a synthetic aperture radar mode which has significant capabilities albeit not the full spectrum envisioned for HRR.

IMPACT ON ZERO FUNDING

QUESTION: The Senate Armed Services Committee zeroed SCSC, without providing an explanation for the reduction in funding. What would be the impact of not funding the program in FY 1986?

ANSWER: The SCSC program provides the dedicated B-52G conventional force with an enhanced worldwide warfighting capability against land and maritime targets.

The FY86 request completes the RDT&E for the Integrated Conventional Stores Management System (ICSMS) ($4.4M), and provides funding to demonstrate the Special Access Required HAVE DARK technology ($3.8M) and High Resolution Radar (HRR) ($63.8M) targeting sensors. Failure to provide FY86 funding for SCSC will terminate the weapons integration RDT&E which is already 90 percent funded, and terminate demonstration of the improved targeting sensors.

SRAM II

QUESTION: You could not provide Congress with a total development cost for the SRAM II proposed in the President's budget. The House Armed Services Committee says it could exceed $1 billion. If you follow Senate direction to develop an "austere SRAM II" based on existing technology, what is the estimate of its total development costs?

ANSWER: It is highly unlikely that the development costs for any version of SRAM II being considered by the Air Force will approach $1 billion. The Air Force is currently performing trade studies to evaluate various missile configurations and propulsion types. Detailed cost analyses will be provided with the results of these studies which will allow comparison of the full range of proposed designs including an "austere SRAM II." In August all cost, performance and risk tradeoffs will be evaluated against the requirements and a preferred SRAM II configuration will be selected. The "austere SRAM II" configuration will be fully considered during the entire selection process. As directed, study results will be provided to Congress no later than 1 February 1986.

DESIGN SERVICE LIFE

QUESTION: Do current SRAMs in the inventory already exceed their design service life?

ANSWER: The SRAM was designed in the 1960s with a 10 year service life. The missiles were built and deployed between 1972 and 1975. The current SRAM is now exceeding its designed service life with no replacement available until the IOC of SRAM II in 1992.

SUPPORTABILITY

QUESTION: Will supportability be a key criteria in your source selection process?

ANSWER: Supportability has been a key ingredient in each missile system contractor's design for SRAM II. Accordingly, each design will receive a qualitative assessment as to the likelihood of meeting the reliability, maintainability, availability and payload exchange requirements. This assessment will receive equal consideration with cost and operational utility.

PHASE II SRAM WARHEAD STUDY

QUESTION: Have you initiated phase II of your SRAM warhead study? Does it show that you need a new warhead to be effective, and that existing technology will not suffice?

ANSWER: Phase II study for SRAM II warhead was initiated in March 1985. Warhead alternatives are being studied with the Department of Energy, and both existing warheads and new designs will be considered. Mission requirements, rather than technological improvements, will be the determining factor for warhead option selection. All inputs for the study will be submitted by January 1986 with the final report published in May.

B-1B INTEGRATION

QUESTION: You have a program IOC of 1992 for SRAM II. This is some six years past the B-1B IOC. Are you doing preparatory work on B-1B integration?

ANSWER: The B-1B is considered the primary carrier for SRAM II. As such, the missile designs will all be compatible with the B-1B flight environment. Each missile system contractor is studying the SRAM II/B-1B interface so that their designs will meet B-1B requirements.

COMMON STRATEGIC ROTARY LAUNCHER (CSRL)

QUESTION: The Air Force is requesting $72.6 million in R&D and $80 million for procurement of five CSRLs. The CSRL is a multipurpose munitions launcher for the B-52H, B-1B and ATB. It will carry current and future gravity bombs, SRAMs and cruise missiles internally.

Full-scale development of the CSRL is proceeding, with aircraft modifications for the CSRL and B-52H flight testing beginning in September 1985.

Last year, Congress deleted procurement funds for CSRL, causing a year's slip in the IOC of the program (on the B-52H) for FY 1990. This year, the Air Force is requesting $80 million to start procurement of five CSRLs.

Will the CSRL provide substantial life cycle cost savings by reducing Air Force support costs?

ANSWER: The Air Force Systems Command performed an in-depth cost study which determined there is a life cycle cost advantage of $130M-$260M with CSRL versus unique alternative launchers. The life cycle support costs for CSRL are $20M less than the support costs for unique launchers due to replenishment spares provisioning. Fewer unique spare parts will be required to support the CSRL.

ALTERNATIVE TO CSRL

QUESTION: At this point, is the only alternative to CSRL to develop three separate launchers for each bomber?

ANSWER: Yes. If CSRL is not procured, three separate launchers will have to be developed to accommodate the strategic weapons (ALCM/ACM, SRAM II and gravity bombs) planned for employment on the B-52H, B-1B and ATB.

B-1B IOC FOR CSRL

QUESTION: CSRLs are being procured for the B-52H (96 aircraft plus spares) and the ATB, while launcher conversion kits will be procured for the B-1B. As the B-52H are retired, their CSRLs will be transferred to the B-1B.

When is the established IOC date for the CSRL to go into the B-1B?

ANSWER: Because there is no date set for retirement of the B-52H, there is no established IOC for the CSRL on the B-1B. As the threat dictates and consistent with force structure planning, the CSRLs will be transferred to the B-1B.

PROCUREMENT STRATEGY

QUESTION: You are programming procurement of CSRL conversion kits for the B-1B in the current budget request. But CSRL will not be ready until FY 1990, and it is unclear when the B-52Hs getting CSRLs will be retired.

Do you feel that this is a sound procurement strategy? Shouldn't you either be reducing your B-52H procurements for CSRL, or deferring procurement of B-1B conversion kits?

ANSWER: We feel this is a sound strategy. The B-1B CSRL conversion kits purchased with B-1B baseline funding will be delivered in FY88/89. This will provide assurance that, should changes in operational requirements dictate, an earlier than planned transfer of the launchers to the B-1B could occur.

These kits can be purchased most economically by exercising prepriced options on existing contracts using baseline monies. If purchased later as a separate modification effort, the cost would have to be renegotiated in a less favorable business environment and we would expect to pay considerably more for these kits.

TRIDENT II

QUESTION: The budget justification says that full contract amounts have already been negotiated (March 1984) for the Operational Systems Development and Production Contract. Provide the details by year by major cost element.

ANSWER: The amounts negotiated on the TRIDENT II missile subsystem Operational Systems Development and Production Contract with the Lockheed Missiles and Space Company are as follows:

(Then Year Dollars in Millions)

Appropriation	FY84	FY85	FY86	FY87	FY88	FY89	FY90	TOTAL
RDT&E,N	627	913	1048	834	533	213	53	4221
WPN	-	78	195	655	405	96	53	1482
SCN	28	7	7	6	20	-	-	68
TOTAL	655	998	1250	1495	958	309	106	5771

QUESTION: What are the yearly targets, ceilings and fees for the contract?

ANSWER: The annual increments contained in the previous answer constitute the contract target amounts for those years. The totals reflect inclusion of a target incentive fee of approximately 8.8% of the contract value. The contract incentive fee limitations are a minimum of 3.7% and a maximum of 14.2%.

QUESTION: Identify the production continuity items and their programmed monthly production rates and the minimum sustaining monthly production rates.

ANSWER: Breakdown of FY 1986
TRIDENT II Production Continuity
Advance Procurement
(Dollars in Millions)

Production Continuity Category/Commodity	Programmed and Minimum Sustaining Monthly Production Rate	FY 1986 Request
Production Continuity with Minimum Rate Considerations: Quantity of full funded end items in FY 1986 is insufficient to maintain the minimum monthly production rate.		
MK-5 Reentry Body Shell Components -		
Antenna Window Blanks	130	$ 3.6
Heat Shields	75	6.6
Machined Antenna Windows	130	0.7
Machined Nose Assemblies	160	3.1
Low Voltage Initiator Components	Various	0.9
Separation Nut Components	Various	1.5
Thruster Assembly Components	Various	0.8
Thruster Cartridge Components	Various	0.3
Subtotal Production Continuity with Minimum Rate Considerations		$17.5

Production Continuity Category/Commodity	Programmed and Minimum Sustaining Monthly Production Rate	FY 1986 Request
Production Continuity with Leadtime Considerations: Leadtime dictates FY 1986 procurement; minimum monthly rate dictates quantity.		
TRIDENT II Missile/Test Instrumentation Components -		
Operational Amplifiers	700	$ 0.9
Resistors	2000	0.2
Diodes	1000	0.5
Linear Analog/Digital Chips	400	1.4
Large Scale Integrated Circuit Gate Arrays (CGA'S)	500	1.5
Octal Source Drivers	300	0.4
Read Only Memory/Random Access Memory Chips	900	1.5
Small And Medium Scale CGA'S	600	1.8
Power Transistors	550	0.2
Miscellaneous Electronic Parts	Various	0.2
MK-6 Guidance System Components -		
Captive Line Parts (Procure more than 80 different configurations of Semiconductor parts at a combined minimum production rate of approximately 300,000 parts per annum.)	Various	116.4
Passive Parts (Capacitors Diodes, Magnetics, and Resistors)	Various	23.5
Inertial Measurement Unit (IMU) Critical Parts (Connectors, Slip Ring Assemblies, Resolvers, Torque Motors, and Shock Mounts)	Various	7.0
Beryllium Machined Parts and Optical Elements required in manufacture of MK-6 IMU's and Electronic Assemblies.	Various	16.8
Subtotal Production Continuity with Leadtime Considerations		$172.3

Production Continuity Category/Commodity	Programmed and Minimum Sustaining Monthly Production Rate	FY 1986 Request
Production Continuity Follow-on to TRIDENT I Program: Requirement driven by need to continue or complete material and end item production begun in the TRIDENT I program to avoid restarting production lines and requalification.		
MK-4 Reentry Systems -		
Machined Nose Plugs	46	$2.8
Substrate Forgings	500	0.8
MK-4 Reentry Body (REB) Shells- (Procure (d) MK-4 REB'S as production continuity to maintain minimum annual production rate of (d). Balance of (d) MK-4 REB'S being procured in TRIDENT I program.)	[Deleted]	4.7
MK-4 Arming, Fuzing & Firing (AF&F) Systems (Procure (d) MK-4 AF&F'S required to avoid gapping of Department of Energy's manufacturing line. This buy represents the final production run of MK-4 AF&F'S and, when combined with systems being provided as Government Furnished Equipment from the TRIDENT I program, will support TRIDENT II requirements for the life of the program.)	Final Buy	1.0
Subtotal Production Continuity Follow-on to TRIDENT I Program		$9.3
Life-of-Type Procurement: Minimum production lots equal or exceed total program requirements or supply is a foreign source whose continued participation cannot be guaranteed.		
TRIDENT II Missile and MK-5 REB Shell Material -		
Quartz Yarn (Foreign source dictates buy out to assure availability of material for manufacture of missiles and REB shells through completion of the TRIDENT II program.)	Single Buy	$4.3

Production Continuity Category/Commodity	Programmed and Minimum Sustaining Monthly Production Rate	FY 1986 Request
MK-5 REB Separation System Components -		
Tolerance critical components and explosives whose minimum production lots equal or exceed total TRIDENT II program requirements:		
Bolt Catcher Ordnance	Single Buy	1.4
Low Voltage Initiator Ordnance	Single Buy	0.1
Thruster Assembly Ordnance	Single Buy	0.1
Thruster Cartridges	Single Buy	0.1
Subtotal Life-of-Type Procurement		6.0
Total FY 1986 TRIDENT II Production Continuity		$205.1

QUESTION: For FY86 and FY87, identify the specific items fully funded, their quantities and costs, that are funded out of the advance procurement funds.

ANSWER:

Fully Funded End Items
Budgeted in TRIDENT II
Advance Procurement
(Dollars in Millions)

	FY 1986		FY 1987	
End Item	Quantity	Cost	Quantity	Cost
MK-4 Reentry Body Shell	[deleted]	$4.7	[deleted]	$12.7
MK-4 Arming, Fuzing & Firing System	[deleted]	$1.0	-	-

QUESTION: Last year's budget projected an FY86 requirement of $15.4 million for production continuity and $264.3 million for long lead materials. Explain why the actual FY86 budget request is so different.

ANSWER: In point of fact the items to be procured in the FY 1986 TRIDENT II advance procurement request remain essentially the same as those presented to the Congress last year, as do the reasons for their procurement. What has changed is the manner of budgetary display. Subsequent to submission of the FY 1985 Budget, it was determined that the great majority of FY 1986 advance procurement items, though driven by leadtimes which dictated their purchase in FY 1986 to support D-5 missile and guidance system production beginning in FY 1987, are essentially requirements which, when viewed in terms of their year-by-year acquisition over the course of the D-5 program, are generated by the need to maintain minimum production rates to assure product homogeneity and performance reliability. In other words, in

FY 1987 and beyond these items must be procured in quantities which will exceed the annual full funded requirement and consequently qualify as production continuity vice long lead requirements. The sole effect has been the establishment of a labeling convention which more accurately defines the advance procurement requirement over its entire procurement history.

QUESTION: In reponse to committee questions at a July, 1983, hearing, the Navy said with respect to the potential excess TRIDENT I (C-4) materials: "Efforts are being extended to maximize usage of the already procured materials by possible application to the follow on D-5 missile program. The extent to which this may be achieved is undetermined at this time pending completion of final design specifications of the D-5 missile."

Identify any and all materials available for use on the D-5 program. If none, provide some rationale.

ANSWER:

TRIDENT I Materials
To be Used on the
TRIDENT II Program
(Dollars in Millions)

Commodity	Value
Guidance System Components	
Passive Parts (Capacitors, Diodes, Magnetics, and Resistors), Captive Line Parts (Semiconductors), and Inertial Measurement Unit Critical Parts (Connectors, Slip Ring Assemblies, Resolvers, Torque Motors, and Shock Mounts)	$ 8.7
MK-4 Reentry System Components	
Forward and Aft Substrate Forgings, Aft Closures, Release Assembly Hardware, Isocouplers, Coaxial Adapters, Heat Shields, Windows, Nose Plugs, Positive Mate Monitor (PMM) Connectors, Forward and Aft Thermal Assemblies, Ordnance Items, and Fuzes	$62.1
Missile System Components	
Bendix Connectors, Yardney Battery Connectors, PMM Connectors, Bellows, Tubing, Forgings, Microcircuits, Transistors, Integrated Circuits, Cruciforms, Blanks, Carbon Fabrication, Colloidol Silica, Silica Powder, Quartz Yarn, and Right Angle Connectors	$32.1
Total TRIDENT I Materials To be Used on the TRIDENT II Program	$102.9

QUESTION: For both FY85 and FY86, specify what will be bought with the $113.6 million and $124.1 million in "SWFLANT Planning and Outfitting" funds. Specify the type of building or activity involved and when the building will be ready for installation of equipment.

ANSWER:

FY 1985 TRIDENT II
SWFLANT Planning and Outfitting
(Dollars in Millions)

	FY 1985 Requirement
Strategic Weapons Facility, Atlantic (SWFLANT) Planning and Activation (includes requirements for contractor design review, facility design criteria, and equipment installation design for missile processing buildings at SWFLANT)	$27.5
SWFLANT Initial Outfitting required to establish a TRIDENT II (D-5) missile processing capability at SWFLANT based on the following key program milestones:	86.1

D-5 missile Initial Operating Capability (IOC) 12/89
First Performance Evaluation Missile (PEM) flight test 3/89
Start D-5 PEM missile processing at SWFLANT 7/88
Installation, Test, Checkout and Equipment/Facility Integration commencing in FY 1987 (Proofing)
Equipment procurements in FY 1985 based on lead-time-away requirements

Breakdown of SWFLANT Initial Outfitting Costs

Building to be Outfitted	Start Const.	Start Install.	Start Proof.	Start Msl Process.	
Inert Components & Control Bldg. (ICCB)	1/85	10/86	4/87	7/88	(43.6)
Vertical Missile Packaging Bldg. 1 (VMPB-1)	1/85	3/87	11/87	11/88	(3.2)
Missile Assembly Bldg. 1 (MAB-1)	2/85	10/86	6/87	9/88	(8.7)
Strategic Weapons System Supply Warehouse (SWSSW)	1/85	9/86	12/86	4/87	(3.5)
Technical Services Bldg. (TSB)	5/85	8/86	2/87	9/87	(12.9)
Equipment Maintenance Bldg. (EMB)	2/85	8/86	9/86	11/86	(3.5)
Engineering Services Bldg. (ESB)	1/85	6/86	9/86	11/86	(0.3)
Roving Equipment (Equipment not tied to a building per se but required to support installation, test, checkout and equipment/facility integration commencing in FY 1987.)					(10.4)

Total FY 1985 SWFLANT Planning and Outfitting $113.6

FY 1986 TRIDENT II
SWFLANT Planning and Outfitting
(Dollars in Millions)

	FY 1986 Request
SWFLANT Planning and Activation	$29.0
SWFLANT Initial Outfitting requiring equipment procurements in FY 1986 on a lead-time-away basis to support key D-5 missile processing milestones at SWFLANT and the 12/89 IOC of the D-5 missile	95.1

Breakdown of SWFLANT Initial Outfitting Costs

Building to be Outfitted	Start Const.	Start Install.	Start Proof.	Start Msl Process	
Explosive Handling Wharf 1 (EHW-1)	1/86	7/88	10/88	3/89	(24.6)
Motor Inspection Bldg. (MIB)	1/86	8/87	11/87	9/88	(4.8)
Vertical Missile Packaging Bldg. 2 (VMPB-2)	1/86	4/88	11/88	3/89	(4.3)
Reentry Body Complex (RBC)	1/86	4/88	6/88	11/88	(12.9)
Missile Assembly Bldg. 2 (MAB-2)	2/86	12/87	10/88	5/89	(8.3)
Radiographic Inspection Bldg. (RIB)	1/86	1/88	8/88	7/89	(21.0)
Missile Parts Warehouse (MPW)	1/85	12/87	1/88	7/88	(0.3)
Maintenance Support Bldg. (MSB)	5/85	1/87	5/87	10/87	(6.2)
VMPB-1	1/85	3/87	11/87	11/88	(1.6)
MAB-1	2/85	10/86	6/87	9/88	(1.6)
Roving Equipment	-	-	-	-	(9.5)
Total FY 1986 SWFLANT Planning and Outfitting					$124.1

TRIDENT II Missile Funding Strategy

QUESTION: Admiral, your TRIDENT II advance procurement request seems to exceed actual outyear production needs. Why is so much advance procurement needed in the Navy strategic missile programs compared to the Air Force programs.

ANSWER: While I can not comment on Air Force programs,

two significant points should be made. First, I would like to point out that advance procurement requirements for the TRIDENT II program constitute approximately 9.4% of the total procurement program, whereas nearly 16.5% of the currently deployed TRIDENT I missile program was advance procured. This percentage reduction is the result of continued efforts to minimize advance procurement while simultaneously constraining missile end-item procurement lead time to two years.

Second, the Navy's TRIDENT II program requires the procurement of 760 production missiles to support the eventual deployment of 17 OHIO Class submarines. This inventory objective is significantly higher than that required by the Air Force. Missile procurements will commence in 1987 and continue, uninterrupted, at a production rate of 6 per month through to the late 1990s. In order to maintain a reliable, uniform, population of missiles it is imperative that appropriate measures be taken to ensure that critical missile components be available throughout the operational life of the program. The levels of advance procurement contained in the current request have been structured based on these needs.

QUESTION: Doesn't this $205 million in "production continuity" funding buy parts and components that won't be needed in your production for several years?

ANSWER: Of the $205.1 million requested for production continuity in FY 1986, $172.3 million is essential to support early missile and guidance system production which commences in FY 1987. Included within the remaining $32.8 million are the following requirements: Life-of-Type Buys totalling $6.0 million necessary to support D-5 missile and MK-5 Reentry Body (REB) Shell procurements through the end of the D-5 program; Follow-On Buys to TRIDENT I Procurements totalling $9.3 million needed to avoid interruption of MK-4 Reentry System, MK-4 REB, and MK-4 Arming, Fuzing and Firing System manufacturing lines; and Production Continuity Buys totalling $17.5 million needed to maintain minimum monthly production rates of MK-5 REB components in FY 1986.

QUESTION: How is this different from incremental funding? Don't these large advance buys of components commit future Congresses to finish paying the bill?

ANSWER: Advance procured production continuity components are funded annually to completion, unlike incremental funding; therefore, future Congresses are not committed to finish paying the bill.

QUESTION: How much of your so-called production continuity funding is for materials that will be surplus to annual missile production needs? And why shouldn't we defer any surplus financing?

ANSWER: As indicated earlier, less than $33.0 million of the $205.1 million requested for production continuity in FY 1986 is not immediately required for missile production needs during the FYDP timeframe. However, should this amount or any portion thereof be deferred to subsequent fiscal years, the deleterious effect such action would produce would far outweigh the modest cost savings realized in FY 1986. Specifically, a number of manufacturing lines producing process-sensitive commodities essential to the overall reliability of the TRIDENT II missile would have to be gapped, thereby creating the very conditions which the production continuity program was designed to avoid: viz., the loss of product homogeneity and an attendant decrease in the performance reliability of the D-5 missile, and increased total program costs.

QUESTION: If you think you have to buy so much in advance, why don't you propose multiyear procurement for TRIDENT II?

ANSWER: We are buying the minimum in advance procurement required to satisfy component reliability requirements. Multiyear procurement does not offer any advantages, either financially or from a reliability standpoint, to this program.

QUESTION: Why can't the production rates of these critical items be established to support the missile production rate and avoid these large advance procurement payments?

ANSWER: The tremendous increase in cost and virtual guarantee of losing a homogeneous population of missiles, thereby sacrificing our ability to measure and estimate the reliability of the missile, strongly militate against dictating extremely low production rates for unique and critical components for the TRIDENT II missile. A strategic missile like the D-5 is an extremely complex end item composed of a variety of components ranging from advanced, state-of-the-art subassemblies to simple fasteners and manufactured in quantities ranging from handcrafted subassemblies to large volume basic materials. The minimum rates for each of these items are the result of technical determinations made by engineering and quality assurance personnel and cannot be artificially constrained. The need for such production continuity was a lesson learned from the POSEIDON program which played a major role in the success of TRIDENT I. The Congress has recognized the need for production continuity and has consistently endorsed this concept since 1976.

QUESTION: Why are 5 to 6 years of this development and production program being done on a cost plus incentive fee contract? I thought the Secretary had a fixed contract policy in the Navy?

ANSWER: The TRIDENT II missile development and production program, which covers a span of six years and supports the concurrent construction of the first TRIDENT II capable submarine as well as the development and construction of an entirely new missile assembly facility at Kings Bay, Georgia, is a moderate to high risk program, but one which is achievable with carefully structured contracts and our FBM experienced team of contractors.

The use of fixed price contracts was considered in the development of the acquisition strategy. However, the use of fixed price contracts for the development and early production of the D-5 missile system was determined to be totally inappropriate and not in the best interest of the government.

In a fixed price environment, cost becomes the primary motivator to a contractor. In a program such as D-5, where the accuracy objective and the intricate schedule relationship creates a high to moderate program risk, such cost motivation could be counterproductive. With the entire burden of cost risk shifted to the contractor, schedule and technical requirements become secondary. Three possible consequences are immediately evident.

First, the size and relatively high risk in achieving program objectives would expose a contractor to far greater financial risks in a fixed price than in a cost type contracting environment. Therefore, it is reasonable to assume that fixed price contract values would be significantly greater than we currently estimate this program will cost if conducted with carefully structured, cost reimbursable incentive fee contracts.

Second, where confronted with a choice among schedule, quality and cost considerations, cost will invariably be paramount. The consequence of such a choice, where schedule or quality suffer, could have impact far beyond the subsystem for which the particular contract is responsible.

Finally, the use of fixed price contracts in this moderate to high risk environment would seriously inhibit the full cooperation and integration of the contractor team that is so critical to the successful achievement of program objectives.

Fixed price type contracts will be introduced into the D-5 program on a time scale appropriate to each individual subsystem. In general, this will occur for each subsystem when the design is mature, there is confidence in the production process, and adequate cost data have been collected while the process is stable and producing reliable equipment.

TRIDENT II Operational Test Missiles

Your requirement for TRIDENT II operational test missiles — the exact number may be classified — is more than twice that for the MX and PERSHING II programs even though the requirement is based, as I understand it, on the same JCS memo, 344-75. Staff estimates that is about $5 billion worth of extra missiles.

QUESTION: Explain why the Navy needs twice as much testing as the Air Force or Army?

ANSWER: JCS Memo SM-344-75 has been superseded by JCS Memo SM-477-75, which provides more detailed guidance than the former document.

[Deleted].

QUESTION: Has the Navy considered the use of slightly different statistical technique — so called Bayesian statistics — in computing the TRIDENT II test missile requirements as the Air Force did? If not, why not?

ANSWER: The Navy uses Bayesian techniques to produce weapons system performance factors during the first year of system deployment when representative flight test data is scarce to non-existent. Such data is always the subject of careful caveats as to source and validity. Our experience is, however, that only end-to-end testing of the weapons system in its operating environment, including actual missile launch and flight, can produce reliable, representative performance factors. Some examples of Navy experience include:

- o The profile of system reliability versus time since initial deployment is completely different for the POLARIS (A3), POSEIDON (C3) and TRIDENT I (C4) systems. An a priori assumption that a later system would reflect the performance of an earlier one would be wrong.

- o Non-flight test results for the POSEIDON (C3) system predicted a much higher reliability than was demonstrated by early flight testing. Failure modes found in flight testing were not predicted by non-flight testing. Corrective action to restore system performance could only be validated by flight testing.

- o More recently, TRIDENT I (C4) first stage motor anomalies were not predicted by non-flight testing and were only found, quantified, corrected and validated by flight testing.

ELF

QUESTION: Have all legal issues surrounding ELF construction in Michigan and Wisconsin been resolved?

ANSWER: On 31 January 1984 a court injunction stopped further construction of ELF until a supplemental environmental impact statement was filed. Injunction was issued by Judge Barbara B. Crab. Lifting of the Court injunction by the Seventh Circuit Court of Appeals in Chicago, Illinois, on 18 June 1984 removed the last legal issue surrounding ELF.

QUESTION: Other than annual operations and support and some small R&D funding, most ELF engineering and other procurement funding ends after FY-87.

When is the IOC for the system, and at what point will you have a fully operational ELF capability?

ANSWER: The initial operational capability for the ELF system is June 1986; a fully operational ELF capability will be achieved by the end of FY-88.

SUBMARINE LASER COMMUNICATIONS

QUESTION: Last year this committee added $2.5 million to Navy RDT&E to accelerate development of submarine laser communication, and promote the transition of the program from DARPA to the Navy. We requested that DOD provide a joint DARPA/Navy of report outlining the potential for establishing an engineering development program for a submarine laser communications system, along with outyear program milestones and funding profiles to support that objective.

To date, no such report has been submitted to this Committee. What is the reason for the slow progress?

ANSWER: The report was submitted by DOD on 22 May 1985. A copy is attached.

(CLERK'S NOTE: The joint DARPA/Navy Report is classified. It has, therefore, been retained in the subcommittee files.)

QUESTION: What future does the Navy really see for strategic laser satellite communications.

ANSWER: Recent developments in laser satellite communications have been very encouraging. The Navy is currently evaluating the cost effectiveness and operational utility of a satellite laser communications system for application in strategic submarine communications and other uses. Satellite laser communications has potential to improve connectivity to submarines. Such a system is envisioned as a complement to rather than a replacement for existing systems.

QUESTIONS SUBMITTED BY SENATOR D'AMATO

B-52 BOMBERS

QUESTION: How many B-52 bombers did our Strategic Air Command have in 1970? How many B-52 bombers does SAC have now? Is SAC performing a wider variety of missions now than it was in 1970?

ANSWER: In 1970 the Strategic Air Command (SAC) had 459 B-52s in its inventory. This B-52 force consisted of "C", "D", "E", "F", "G" and "H" models. Today SAC has 241 B-52s as part of its bomber force, however, this force now consists of only "G" and "H" models.

The overall purpose of the B-52 force has remained the same over the years--to provide the nation with a strong, credible conventional and nuclear deterrent force. Although some of the weapons used by the B-52 have been improved through the years, the B-52 continues to perform the same two primary missions it did in the 1970s: nuclear support for the Single Integrated Operational Plan (SIOP) and conventional bombing in support of theater commanders. In addition to nuclear and conventional weapons delivery, today's B-52 missions include sea surveillance and maritime interdiction of sea lines of communication.

SAC's BOMBER INVENTORY

QUESTION: What will SAC's bomber inventory look like in the year 2000? How many B-52s, B-1Bs, FB-111s and Advanced Technology Bombers (ATB)?

ANSWER: In the year 2000, the Air Force is planned to have (d) B-52Hs and (d) B-1Bs in the inventory. The (d) FB-111s will have been transferred to the Tactical Air Forces (TAF) as the ATB deploys in the early 1990s. The specific number of ATBs to be procured is special access information.

NUMBER OF TARGETS

QUESTION: Has the number of targets we feel we must be able to attack in the Soviet Union increased or decreased since 1970? General Vessey, The Chairman of the Joint Chiefs, responding to your question for the record last year, stated that the number has increased and that the characteristics of the target base had changed--The targets had gotten harder. Do you see a trend in the number, kind, and hardness of targets in the Soviet Target Base?

ANSWER: Through a long-term dedicated construction program, the Soviets have constructed [deleted.]

The hardness of these targets, which are used for a diverse set of functions (joint commands, air defense, radio communications, launch control facilites, etc.), vary over a wide range. [Deleted].

Beginning in 1968, the Soviets undertook a massive construction program to protect their aircraft by placing them in earth covered reinforced concrete or steel and concrete arched structures. To date, [deleted.]

Similiar protective efforts are on-going in the industrial sector. [Deleted].

In addition to the on-going hardening program, the Soviets are seeking to increase the survivability of their missile systems through mobility. Since 1977, about 400 SS-20 Longer Range Intermediate Range Nuclear missiles have been deployed. The mobility of the SS-20 systems enables both on and off road operations. As a result, the survivability of the SS-20 is greatly enhanced because detecting and targeting them is difficult when they are field deployed. This trend of survivability through mobility is continuing; mobile versions of two new solid-propellant ICBMS, the SS-X-24 and SS-X25, will be deployed.

In summary, there is a continuing trend in the number and types of targets undergoing hardening in the Soviet Union. Additionally, Soviets are seeking to increase their survivability through mobility.

MOBILE SOVIET TARGETS

QUESTION: I understand the Soviets are resorting to more and more mobile systems--for missiles, for command and control, for leadership survival--and that the bomber is the only weapon in our arsenal capable of seeking out these mobile targets. Is the bomber force growing in proportion to the growth of very important mobile Soviet targets?

ANSWER: The Soviets are resorting to more mobile systems to increase their survivability. Currently, the bomber is the only strategic weapon system with the potential for seeking out some of these mobile targets.

The bomber force capability is being expanded to the maximum extent possible to perform the very difficult relocatable target (RT) task. However, force size alone does not equate to capability to attack relocatable targets since the target must be located before a weapon can be applied. Improvements in sensors (radar, threat emitter detection, etc.), delivery systems (Advanced Technology Bomber with stealth characteristics), and weapons (SRAM II) will all increase US capability more efficiently than just adding additional bombers.

Numerous studies are underway to determine the best overall approach to addressing this problem. Focusing strictly on the bomber as an "RT Killer" will not necessarily best support US national policy.

CONVENTIONAL FIREPOWER REQUIREMENTS

QUESTION: Since we have only employed our strategic bombers in a conventional role since Nagasaki in World War II and since there remains a substantial requirement for the kind of concentrated conventional firepower only heavy bombers can deliver, I wonder what the Air Force's plans are to meet these requirements?

ANSWER: The Air Force currently has (d) B-52G and (d) B-52H aircraft which have been modified for internal and external conventional weapons carriage. The B-52Hs will lose their external carriage capability when they are modified for nuclear ALCM carriage in the FY 86-88 time frame. The (d) B-52Gs will not be modified for ALCM carriage and will be kept in the long range conventional role through the 90s. These (d) B-52Gs can deliver 22 tons of gravity bombs or land/naval mines, and (d) of the (d) are being modified to carry HARPOON anti-ship missiles. In addition, the Air Force is pursuing procurement of a conventional standoff weapon for these aircraft. While the B-1B will be our primary penetrating nuclear bomber until the ATB, it could be employed in the conventional role to supplement the B-52, if required.

B-52 CONVENTIONALLY EQUIPPED

QUESTION: How many B-52s did we have in 1970 which were capable, without significant modifications, of delivering conventional bombs in support of our Forces. How many B-52s do we have which can perform in the same role?

ANSWER: In 1970, the Strategic Air Command (SAC) had 459 B-52s in its inventory. These consisted of 30 B-52Cs, 134 B-52Ds, 49 B-52Fs, 164 B-52Gs and 82 B-52Hs. All of these aircraft were capable of delivering conventional weapons.

Today, 241 B-52s remain in the SAC inventory (151 B-52Gs and 90 B-52Hs). Again, all of these aircraft could deliver conventional weapons.

MIX OF BOMBERS

QUESTION: Are you confident the mix of bombers available to the U.S. Air Force in the next decade will be able to meet the requirements of the SIOP (Single Integrated Operational Plan - our national nuclear war plan) and the requirements for conventional support to deployed forces ashore and the requirements to assist the Navy in its sea control tasks?

ANSWER: Yes, the planned Air Force bomber force will be adequate to execute the SIOP, support deployed forces through conventional bombardment, and help the Navy accomplish its sea control mission. A force of (d) standoff B-52Hs, (d) shoot-and-penentrate B-1Bs and some number of penetrating ATBs (ATB program information is special access) will be structured to execute the SIOP. After the retirement of the conventionally dedicated B-52s in the mid-to-late 90s, a dedicated conventional force comprised of a mix of bombers (B-52Hs, B-1Bs, and/or ATBs) will be supplemented by dual-tasked B-1Bs and ATBs to support deployed forces and aid the Navy. The exact number of ATBs required to fill out the bomber force structure will depend upon arms control, national policy, technology and the threat.

B-1B AS A CONVENTIONAL BOMBER

QUESTION: I have concluded that the B-1B will be a far better multi-role aircraft than the Advanced Technology Bomber. I understand the Advanced Technology Bomber will do best in the nuclear role. There are a number of reasons for my conclusions, but since they relate to the actual characteristics of the two bombers, we can't really talk about them in open session. Do you agree that the B-1B will do a better job as a conventional bomber?

ANSWER: We expect both bombers to be versatile delivery platforms. The B-1B was designed as a multi-role bomber, capable of delivering nuclear and conventional weapons, as well as cruise missiles. Details of Advanced Technology Bomber characteristics are specially controlled under "Special Access Required" procedures. Procedures have been developed to provide this material through the committee staff.

SAC PLANS TO MEET WARTIME REQUIREMENTS

QUESTION: Since we are only buying 100 B-1Bs and, as I understand the plan, they will become Cruise Missile Carriers as the last of the B-52s leave the fleet, I wonder how SAC plans to meet the conventional bombing requirement and the sea control support requirement?

ANSWER: Bomber force structure after the ALCM B-52Gs retire in the early 1990s will depend upon such factors as arms control, technology, national policy, and the threat. Flexibility exists to re-role the 1990s bomber force of non-ALCM B-52Gs, B-52Hs, B-1Bs and ATBs into SIOP and conventional roles as required

The dedicated conventional B-52Gs complemented by dual-roled B-1Bs and ATBs will fulfill the 1990s conventional bombing and sea control support requirements. When the conventional B-52Gs retire as projected in the mid-to-late 1990s, some mix of bombers (B-52Hs, B-1Bs, and/or ATBs) will pick up that dedicated conventional role. ATB procurement can be adjusted in the 1990s to fill-out a force structure that will ensure national objectives are met.

FORCE STRUCTURE OF THE 1990s

QUESTION: Do you believe the force structure you plan for SAC's bomber fleet for the end of the 1990s will be sufficient to execute the SIOP, support deployed forces as through conventional bombardment, and help the Navy accomplish its sea control mission? Please provide an answer for the record allocating your projected late 1990s bomber fleet against your main missions--keeping in mind the proliferation of mobile strategic targets in the Soviet Union, the growth of the Soviet Fleet, and the increased sophistication and firepower of the forces we are likely to encounter if, say, any of the Central Command contingencies became real.

ANSWER: The planned Air Force bomber force will be adequate to execute the SIOP, support deployed forces as through conventional bombardment, and help the Navy accomplish its sea control mission. A force of (d) standoff B-52Hs, (d) shoot-and-penetrate B-1Bs and some number of penetrating ATBs (ATB program information is special access) will be structured to execute the SIOP. After the retirement of the conventionally dedicated B-52s in the mid-to-late 90s, a dedicated conventional force comprised of a mix of bombers (B-52Hs, B-1Bs, and/or ATBs) will be supplemented by dual-tasked B-1Bs and ATBs to support deployed forces and aid the Navy. The exact number of ATBs required to fill out the bomber force structure will depend upon arms control, national policy and the threat.

QUESTIONS SUBMITTED BY SENATOR PROXMIRE

TRIDENT II (D-5) Missile

The Current SAR, published in March 1985, for the Trident II (D-5) missile provides information on the cost and schedule status of six major development contracts (Launcher, Fire Control, Guidance, Navigation, Test Instrumentation and Missile).

According to the SAR, each of these contracts is reported as being behind schedule.

QUESTION: What is the significance of these contract delays?

ANSWER: The D-5 development program, with each of its six subsystems (Launcher, Fire Control, Guidance, Navigation, Test Instrumentation, and Missile) remains on schedule. While the contracts for these subsystems show some internal contractor schedule delays, such delays reflect the effects of normal events during the development phase of a weapon system. Slack has been built into the various phases that make up each contract work schedule and no major contract milestones have been impacted. All major milestones, such as full scale motor firings and delivery of GFE and GFI to the TRIDENT shipbuilder, remain on or ahead of schedule. We still feel confident about meeting the 1989 IOC.

QUESTION: The next major milestone in the Trident II program is the first development flight, scheduled for January 1987. Do you anticipate problems in meeting this milestone?

ANSWER: No. All planned efforts in support of the January 1987 first flight test are on schedule.

SUBCOMMITTEE RECESS

Senator Stevens. We are in recess now until Tuesday, June 4, when we will hear General Paul on drug addiction.

Dr. Cooper. Thank you, Mr. Chairman.

[Whereupon, at 11:55 a.m., Tuesday, May 21, the subcommittee was recessed, to reconvene Tuesday, June 4, 1984.]

LIST OF WITNESSES, COMMUNICATIONS, AND PREPARED STATEMENTS

Page
Abrahamson, Lt. Gen. James, Director, Strategic Defense Initiative Organization 1, 75
  Prepared statement 79
Adams, Brig. Gen. Jimmie V., Special Assistant for Tactical Modernization, Deputy Chief of Staff for Research, Development and Acquisition, USAF 141
Aldridge, Edward C., Jr., Under Secretary of the Air Force 251, 439
  Prepared statement 276

Bacon, Commodore Roger F., Director, Strategic and Theater Nuclear Warfare 485

Cooper, Thomas E., Assistant Secretary of the Air Force for Research, Development and Logistics 141, 393, 475
  Biographical sketch 181
  Joint prepared statement 174
  Prepared statement 481

D'Amato, Hon. Alfonse, U.S. Senator from New York, prepared statements 64, 476

Fornell, Brig. Gen. Gordon E., Special Assistant for ICBM Modernization for Research, Development and Acquisition 475

Goffney, Frank, Office of Secretary of Defense, Policy ....

Hale, Robert F., Assistant Director for National Security, Congressional Budget Office 369

Ikle, Fred C., Under Secretary of Defense, Policy 63
  Prepared statement 68

Kutyna, Brig. Gen. Donald J., Director, Space Systems and C³, Deputy Chief of Staff, Research, Development and Acquisition, Headquarters, USAF 251, 439
  Biographical sketch 316
  Prepared statement 310

Lee, Chester, Director of Customer Services, Office of Space Flight Division, NASA Headquarters 439
Lewin, Commodore Theodore E., Director, Strategic Submarine Division 485
Linder, James, Defense Intelligence Agency 1

Malley, Commodore Kenneth C., Director, Technical Division, Defense Systems Program Office 485
  Prepared statement 489
Monahan, Maj. Gen. George L., Jr., Director of Development and Production, Deputy Chief of Staff for Research, Development and Acquisition, USAF 141
  Submitted statement 404
Moore, Jesse, Associate Administrator, National Aeronautics and Space Administration 439

Pierrot, Ms. Lane 369

Russ, Lt. Gen. Robert D., Deputy Chief of Staff for Research, Development and Acquisition, USAF 141, 393
  Biographical sketch 182

569

Page

Russ, Lt. Gen. Robert D., Deputy Chief of Staff for Research, Development and Acquisition, USAF—Continued
  Joint prepared statement 174
  Prepared statement 397

Steel, Mack, Director of Resources, Office of Space Flight Division, NASA Headquarters 439

Weicker, Hon. Lowell, Jr., U.S. Senator from Connecticut, letter from 207
Williams, Maj. Gen. Harold J.M., Director of Operational Requirements for Research, Development and Acquisition 475

570

SUBJECT INDEX

AIRCRAFT PROCUREMENT AND RDT&E

CONGRESSIONAL BUDGET OFFICE

Page
Advanced tactical fighter (ATF) 384
Advanced technologies 373
Aircraft mix 383
Andrews, Hon. Mark, U.S. Senator from North Dakota, questions submitted by 389
Cost containment alternatives 374, 387
Cost increases 370
Extended service life options 379
F-4 aircraft 371, 375, 381, 389
F-15 aircraft 371, 378
F-16 aircraft 378, 386
F-20 aircraft 372, 379, 382
Fighter aircraft cost increases 377
Five-year plan, cost of 390
Near-term goals 370
Tactical Air Force goals 370
    Budget assumptions 373
    Fighter force 376
Northrop cost estimates 380
Soviet Union, qualitative/quantitative edge over 383
Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by 389

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE AIR FORCE

Acquisition management improvement 179
Additional committee questions 210, 415
Advanced tactical fighter [ATF] 165, 212, 394, 398, 419, 435
Airlift support 186
ALR-74 (radar warning receiver) 224, 236
Alternate fighter engine 167
AMRAAM 401
Andrews, Hon. Mark, U.S. Senator from North Dakota, questions submitted by 242
APG-63 radar 244
B-1 bomber 204, 223, 237, 403
B-52 modifications 223
Base operations 226
Budget request 141, 144
    Priorities and development 143
    Real growth 145
Byrd, Hon. Robert F., U.S. Senator from West Virginia, questions submitted by 245
C-5A coffee maker 202
C-5B Program 231
C-17 airlifter 217, 229
C-130 aircraft budget 232
CBO report 183
CFM-56 Program 238

Page
Civil Reserve Air Fleet [CRAF] 224
Combat aircraft inventory 188
Competition 170, 172, 189, 202
Component repair 222
Depot maintenance contractor support 222, 224
Engine Model Derivative Program [EMD] 168, 213, 214
Engine performance 166, 172, 215
Enhanced JTIDS [EJS] 220
F-4 Modifications 224, 229
F-15, 10-year record of 162
    Bomb racks 242
    Cost increases 394
    Modifications 221, 424
    Unit cost comparison 418, 426
F-16 aircraft 164
    Comparisons with F-20 187, 191, 244, 434
    Flying-hour comparison with F-20 185, 186
    Program 216, 220, 232
    Selected acquisition report 192, 234, 409
    20-year cost of 184, 394, 406
    Unit cost comparison 417, 426
F-20 aircraft 184
    Comparisons with F-16 187, 191, 244, 434
    Flying-hour comparison with F-16 185, 186
    Performance characteristics 194
    Program 216, 232
F-100 engine 240, 414, 430
F-106 aircraft 222
Flying Hour Program 241
Force projection 177, 415, 424
Full scale development [FSD] 219
Guard, reengined aircraft for 432
High-mix aircraft 424
HH-60A aircraft 206, 208
Historical perspective 146
Identification, Friend or Foe [IFF] system 219
Improved Sparrow 402
In-service aircraft, modifications of 154
Inspector General report 195
Investment versus operations 146
Joint advanced fighter engine [JAFE] 169, 213, 214
Kasten, Hon. Robert, U.S. Senator from Wisconsin, questions submitted by 244
KC-135 aircraft 225, 238, 241
LANTIRN system 210
Life cycle costs 198
MA-1 infrared system 243
MAU-12 bomb racks 198, 404
Mil Standard ejector unit 200
MX missile deployment 246
Procurement account 147, 150
    Competitive 187
    Multiyear program 156, 193
    Prioritizations 183
    Strategy 161
Readiness and sustainability 177
Reliability and maintainability initiative 2000 195, 197
Respirator and protective clothing program 245
Spares and repair parts 151, 431
    Replenishment spares 153
Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by 434
Stategic air defense fighters 158
Strategic forces 175
Support equipment and facilities 155
Tactical fighter force 157
Tactical fighter wings 159
Theater forces 178
Unit flyaway cost comparison 416
Warranties 171, 196

Page
Weapons loader ... 205
Wings, distribution of additional ... 425

SPACE PROGRAMS

DEPARTMENT OF DEFENSE

DEPARTMENT OF THE AIR FORCE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Additional committee questions ... 338, 463
Additional orbiter production ... 257
Advanced radiation technology program ... 366
Air defense interceptors ... 321
Air vehicle surveillance ... 299
Andrews, Hon. Mark, U.S. Senator from North Dakota, questions submitted by ... 355
ASAT testing ... 325, 334, 367
BISS [base and installation security system] ... 355
BMEW [ballistic missile early warning] system ... 301
Budget authority, comparative statement of ... 251
Budget request ... 251, 309, 350
CELV ... 258, 265, 268, 271, 277, 356, 440, 446, 456, 463
Centaur G rocket ... 339
Commercial exploration ... 325
CSOC [consolidated space operations center] ... 346, 352
D'Amato, Hon. Alfonse, U.S. Senator from New York, questions submitted by ... 471
DMSP satellite payload ... 273, 341, 345
DSCS [defense satellite communications system] ... 344
ELV growth potential ... 267, 322
    Reprogramming ... 324
Expendable launch vehicle ... 256, 363
Fifth orbiter cost ... 270
Ground-based radar ... 303
IONDS ... 343
IUS versus Milstar ... 335, 338
Johnson Space Center ... 346
Kasten, Hon. Robert, U.S. Senator from Wisconsin, questions submitted by ... 356
Laser Cross-Link Program ... 345
Launch-on-demand capability ... 453
Launch risk and security ... 447
Launch vehicle funding ... 264, 318
    Utilizations ... 266, 310, 317, 365
Martin-Marietta contract ... 324
Military space plans ... 317
Milstar ... 449
Missile surveillance technology program ... 366
NASA, pricing agreement with ... 446
National security launch strategy ... 261
National security requirements ... 452
NAVSTAR ... 338, 353
Operations and maintenance programs ... 348
Over-the-horizon radar ... 298
Pave Paw radar system ... 301
Payload assist module-delta [PAM-D] ... 340
Proxmire, Hon. William, U.S. Senator from Wisconsin, questions submitted by ... 363
Reprogramming request ... 275, 383
Satellite, survivability and hardening ... 329, 330
SDI, implications of ... 452
Second generation transportation system ... 262, 454
Shuttle/ELV mission costs ... 323, 440
Soviet bomber and missile forces ... 295
Soviet launch capability ... 319
Space activity: U.S./U.S.S.R. comparison ... 281, 328
Space biotechnology ... 347
Space boosters ... 351

573

Page
Space contracts, status of ... 361
Space defense systems ... 307, 310
Space launch strategy ... 263, 283
Space surveillance system ... 305
Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by ... 359
Strategic C^3 ... 288, 311, 333
  Assured connectivity ... 291
  Jamming techniques ... 290
  Milstar satellites ... 292, 336
Strategic defense ... 293, 312
SDI, relationship of space shuttle to ... 320
Titan II ... 272, 274, 359, 466
Titan 34D7 ... 259, 260
U.S. radar system ... 295
Vandenberg AFB, construction status at ... 255, 285, 354, 359

STRATEGIC DEFENSE INITIATIVE

DEPARTMENT OF DEFENSE

Department of the Air Force

Alternative SDI programs ... 99
Budget reductions and recommendations ... 76, 88
Cruise missiles, SDI effectiveness against ... 94, 107
Engineers and scientists, need for ... 91
Fletcher Commission ... 85
Hard point technology ... 102
Horserace acquisition ... 78, 88
Innovative science program ... 114
Krasnoyarsk radar ... 105
Laser program, Soviet involvement in ... 93, 94
Mutual assured destruction (MAD) ... 105
Particle beam device, Soviet development of ... 95
Program elements ... 77
Proxmire, Hon. William, U.S. Senator from Wisconsin, questions submitted by ... 129
Radio frequency of quadropole ... 96
SDI research program ... 75
  Personnel requirements ... 113
  Vulnerability of ... 109
Soviet power, summary of ... 86
U.S. weapons testing compliance ... 81

Strategic Defense Initiative Organization

ABM treaty of 1972 ... 7
Additional committee questions ... 42
Advanced IR surveillance ... 22, 55
Allies, SDI funding to ... 40
ALPHA project ... 60
AOS deployment ... 44, 59
Apollo Program ... 36
Army interceptor programs ... 47
ASAT Program ... 36
ATS [accelerator test stand] ... 49
Ballistic missile defense program ... 58
Battle management responsibility ... 44
Boost phase ... 39
Budget request ... 1, 35
Contracting out ... 35
Deployment data cost ... 40, 57
Directed energy weapons programs ... 45
Fletcher Commission study ... 15, 37
Formation of program ... 2, 17
Ground-based lasers ... 47
High frontier concept ... 54
Homing overlay experiment ... 19

574

Page

- Hypervelocity launcher development, 50
- Kinetic energy device, 31
- Management system, 27
- Missile systems:
  - SAM, 9
  - SA-X-12, 9
- Multishot EM gun, 26
- Near-Term Deployment Program, 53
- Neutral particle beam weapon, 23, 49
- Over-the-horizon radar, 11
- Program costs, 2
- Proxmire, Hon. William, U.S. Senator from Wisconsin, questions submitted by, 54
- Research programs, 14, 24
- Reverse technology transfer, 29
- Sary Shagan test range facility, 9
- SATKA Program, 42, 51, 56
- Short wavelength lasers, 47
- Space-based lasers, 46, 61
- Space logistics, 52
- Space power requirements, 48, 49
- Stennis, Hon. John C., U.S. Senator from Mississippi, questions submitted by, 51
- Talon gold tracking experiment, 29
- Terminal imaging radar project, 60
- Terminal point defense, 38
- U.S.S.R.:
  - ABM activities, 5
  - Acquisition radar development, 7
  - Ballistic missile defense, 4
  - General power and effectiveness research, 10
  - Military power, 5
  - National territory defense, 11
  - Radar systems:
    - Henhouse, 8
    - Krasnoyarsk, 8
    - Pechora, 8
    - Rapidly deployable system, 8
  - Space-based laser systems, research into, 12, 30
  - Treaty violations, 32
- VM cryogenic refrigerators, 25
- Workability, 2

UNDER SECRETARY OF DEFENSE FOR POLICY

- Additional committee questions, 119
- Air defenses, 70
- Allies, U.S. SDI approach to, 66, 71
- Alternate SDI Program, 71
- Biological weapons testing, Soviet violations of, 104
- Budget request, 63
- Byrd, Hon. Robert C., U.S. Senator from West Virginia, questions submitted by, 135
- Decoys, Soviet use of, 111
- MX missiles, ballistic missile defense for, 103
- NATO response to SDI, 116
- Nuclear deterrence theory, SDI replacement of, 115
- Proxmire, Hon. William, U.S. Senator from Wisconsin, questions submitted by, 124
- Research and Technology Program, 68
- SDI:
  - Cost-effectiveness of, 112
  - Objections to, 68, 82
- Soviet Union, shared SDI technology with, 89
- Treaty options, 84
- Treaty, Soviet violations of, 66, 92

STRATEGIC PROGRAMS

DEPARTMENT OF DEFENSE

Department of the Air Force

Department of the Navy

Page
Additional committee questions ... 527
B-1B Bomber ... 497, 503, 517, 530, 534, 551, 564
Ballistic missile replacement equipment ... 546
Bomber modernization program ... 478
Budget request ... 475
Cape Canaveral, missile flight tests at ... 487
C-cube network ... 495
CSRL [common strategic rotary launcher] ... 551
D-5 acquisition ... 485, 495, 502, 520
D'Amato Hon. Alfonse, U.S. Senator from New York, questions submitted by .. 564
ELF ... 563
Hardened mobile launchers ... 492
ICBM Program ... 479, 481, 499, 517, 528, 537
King's Bay submarine base ... 485
    SWFLANT ... 487
    TRFLANT ... 487
Krasnoyarsk radar ... 511
Manpower requirements ... 536
Mark 21 versus Mark 5 ... 531
MARV reentry vehicles ... 515, 530
Materials, buildup ... 514
Minuteman squadrons ... 533
MIRV'd missiles ... 493
Missile basing ... 500, 533, 537, 541
MX missile, zero funding for ... 491, 494, 504, 516, 522, 524, 527
Penetration aids ... 542
Pershing missile system ... 524
Poseidon missile system ... 512
SALT treaties ... 510
SCAS [stability and control augmentation system] ... 535
SCSC [strategic conventional/standoff capability] ... 549
Single shot probability of damage ... 540
SLBM fleet ... 519
Small ICBM ... 536, 539, 541
SRAM II ... 550
SS-X-24 mobile missile ... 503
SS-18 warhead capability ... 498
SSBN 734 ... 487
Strategic Defense Initiative ... 499, 507
Strategic systems ... 485
Submarine laser communication ... 563
Superhardened silos ... 493, 501,506, 527, 545
Technological challenges ... 543
Trident II weapon system ... 486, 521, 523, 552
Worldwide airborne command post ... 534

○

576